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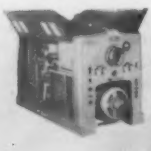

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VOL. 46—No. 4

Welding Engineer

The magazine of joining and severing of materials

This is welding: April, 1961

Cover art work . . . courtesy The Marison Co., South Elgin, Ill.

New York becomes world's welding capital 43

An estimated 18,000 welding-associated visitors will gather this month for the 42nd annual AWS convention, as will approximately 300 welding authorities attending the IIW's first U.S. meeting. International welding focuses on New York City.

Tests prove 9% nickel steel meets cryogenic specs 46

In this first of two special reports, *WE* details the weldability and ductility of 9% nickel steel, one of the two major metals vying for an increased share of the cryogenic market.

★ (For a reprint of this article, circle 248 on Welding Info-Aid Card.)

Thin metals percussive welded without distortion 48

No flux or special equipment is needed with this arc welding method to obtain distortion- and mar-free stud welds on thin metals, as reported by author **Charles A. Gunn.**

How to evaluate shrink and draw strains 50

Shrink and draw strain variations still present serious and frequent problems. But by understanding metals' behavior, design and welding solutions can be developed, according to **Nicholas S. Hodska.**

★ (For a reprint of this article, circle 249 on Welding Info-Aid Card.)

Notch tough steel survey shows fabrication problems 75

Quenched and tempered steels proved best for today's nuclear ship construction. Notch toughness is a major criteria, and **Thomas J. Dawson** discusses methods for obtaining this vital characteristic.

★ (For a reprint of this article, circle 250 on Welding Info-Aid Card.)

NATIONAL WELDED PRODUCTS MONTH ... APRIL ...

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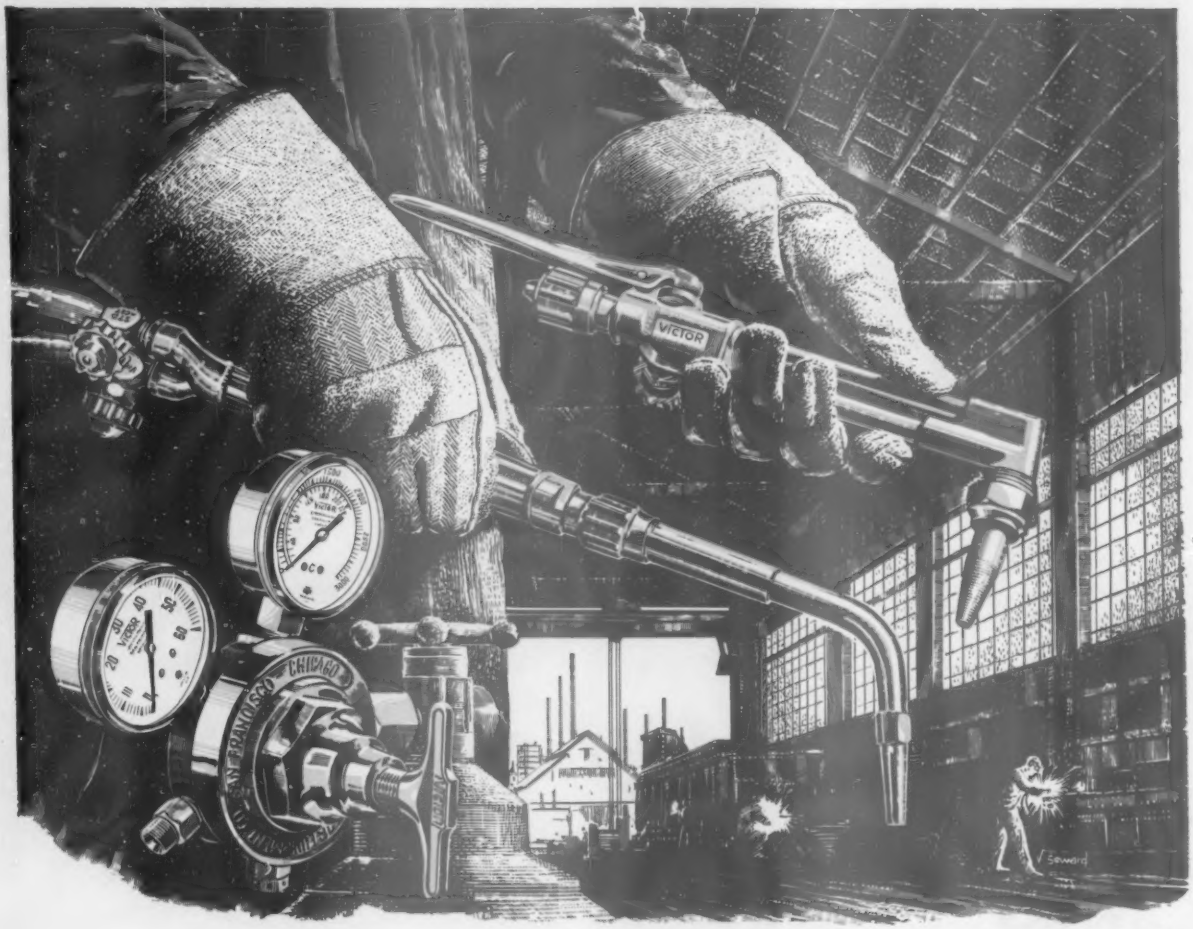

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For more facts Circle No. 155 on Welding Info-Aid Card

April Headlines

EACH of the storage spheres adjacent to the rail siding at this new 140-ton-per-day liquid oxygen and nitrogen plant holds the liquid equivalent of 25 million cubic feet of gas. The plant in Neosho, Mo., was built by Linde Co., New York City.

Linde opens 140-ton-per-day liquid oxygen, nitrogen plant

A new liquid oxygen-nitrogen plant built by Linde Co., New York City, is in production supplying rocket engine development facilities at Fort Crowder Reservation, Neosho, Mo.

The new 140-ton-per-day capacity plant will also supply industrial gas consumers throughout the southwest by railroad tank cars and highway liquid transports.

Each of the storage spheres adjacent to the rail sidings of the new plant holds the liquid equivalent of 25 million cubic foot of gas.

The Neosho plant is the fourth of five Linde plants designed for the national aerospace program. Two others producing liquid oxygen and nitrogen are in operation at Pittsburg, Calif., and Huntsville, Ala.

A third plant is currently producing 6.5 tons per day of liquid hydrogen rocket fuel at Torrance, Calif. Construction of a 26-ton-per-day liquid hydrogen plant is scheduled to get under way at Fontana, Calif., this June.

Ohio State plans welding conference

The Department of Welding Engineering, The Ohio State University, Columbus, Ohio, will present a summer conference course on fundamentals of welding engineering from June 12-23.

The intensive two-week program of instruction and practice is intended to help supply the educational needs of management, engineers, production supervisors, and technicians. No specific prerequisite training or experience is required for registration.

Course content will not be restricted to any particular type of welding fabrication but is intended to provide training equally applicable to the structural, piping, pressure vessel, nuclear, aircraft, automotive and other fields.

Inter-relationships of welding process, production techniques, and quality control will be emphasized.

For further information contact William L. Green, Dept. of Welding Engineering, 190 W. 19th Ave., The Ohio State University, Columbus 10, Ohio.

Color coding program designed by Page Steel

A new color coding program (first announced in **Weld World**, Nov. 1960) for easy inventory identification of welding wire is being used by the Page Steel & Wire Division of American Chain & Cable Co., Inc., Monessen, Pa.

Special color coding was previously used by printing bright strips of identifying colors on the cardboard coil liners. The color coding system has been expanded to all forms of the firm's welding wire packaging and covers all grades of automatic welding wire.

Amperex offers computer guide

A computer guide to determine performance of RF doubles and triplers, as well as straight-through amplifier electron tubes, is being offered at no charge by Amperex Electronic Corp., New York City.

The guide, which should be of value to designers of transmitter, telemetry and mobile equipment, as well as ultrasonic, dielectric and induction heating equipment, can be obtained by writing on company stationary to: Amperex Electronic Corp., Advertising Department, 230 Duffy Ave., Hicksville, Long Island, N.Y.

L. W. STETTNER, at left, president of Victor Equipment Co., San Francisco, discusses distribution plans with R. T. Brown, general manager of the welding products division of Metal & Thermit Corp., New York City. Victor has been named as prime distributor of Metal & Thermit's welding line in southern California.

CLEAR plastic tubes capped at each end for easy removal of grinding wheels have been developed by the Bay State Abrasive Products Co., Westboro, Mass. The new package is part of an over-all new system of packaging Bay State products.

General Vacuum moves to new location

General Vacuum Corp., formerly in East Boston, Mass., has moved to a new multi-story building at 81 Hicks Ave., Medford, Mass.

The manufacturing area of the new site includes a high-bay area for assembly and test of very large systems.

Airco builds $5 million air separation facility

A $5 million air separation facility to serve the petrochemical industry is being built by Air Reduction Sales Co., New York City.

Total capacity of Airco's plant, to be located at Claymont, Del., will be in excess of 350 tons of oxygen per day — about 120 tons per day will go to the SunOlin Chemical Co. plant adjacent to the new facility.

COMING EVENTS

APRIL 10-15: International Institute of Welding Meeting, Sheraton-Atlantic Hotel, New York City.

APRIL 17-21: 42nd Annual Convention, AWS, Commodore Hotel, New York City.

APRIL 18-20: AWS Annual Welding Exposition, Coliseum, New York City.

APRIL 24-25: IAA Annual Meeting, Sheraton-Plaza Hotel, Boston.

MAY 8-10: 17th Annual Convention, NWSA, Hotel Commodore, New York City.

MAY 22-25: The Design Engineering Show, Cobo Hall, Detroit.

JUNE 8-9: First Western Conference, NEMA, Biltmore Hotel, Los Angeles.

JULY 4-7: 27th Annual Meeting, The National Society of Professional Engineers, Olympic Hotel, Seattle, Wash.

JULY 18-20: Western Plant Maintenance and Engineering Show & Conference, Pan Pacific Auditorium, Los Angeles.

Hobart courses cover welding processes

A course in gas shielded arc welding processes will be given at the Hobart Technical School, Troy, Ohio, April 24-28.

The course is designed for the welding supervisor, foreman, or superintendent, and others involved with any gas shielded process.

Courses in the school scheduled for May include: Welding fundamentals for supervisors and engineers, May 8-12; Arc welding inspection and quality control, May 15-19; and Automatic welding for management, May 22-26.

Registration can be obtained by writing to the school.

Plastic, steel permanently bonded

THIS new plastic-clad steel plate from the laboratories of Lukens Steel Co., Coatesville, Pa., will not come unstuck. This marks the first time a sheet of plastic has been bonded permanently to a steel plate. The plastic-clad steel is said to be ideal for bulk chemical containers.

IAA to hold 63rd anniversary convention

ELMER H. SMITH, founder of Smith Welding Equipment Corp., Minneapolis.

Elmer H. Smith to get IAA's Morehead Medal

Elmer H. Smith, founder and current chairman of the board of the Smith Welding Equipment Corp., Minneapolis, has been named recipient of the International Acetylene Association's James Turner Morehead Medal for 1961.

Presentation of the medal, which is the IAA's highest award, will be made to Mr. Smith during the IAA 63rd Anniversary Convention at a banquet at the Sheraton-Plaza Hotel in Boston on April 25.

The medal is awarded annually to the individual who has done the most for the acetylene or calcium carbide industry.

L. L. McBurney, past IAA president, will present the award to Mr. Smith who celebrated his 50th year in the welding equipment business in 1959.

The convention will be held on April 24-25 at the Sheraton-Plaza Hotel.

Principal speaker at the opening-day luncheon will be Gerald W. Blakely, Jr., president of Cabot, Babot & Forbes Co., Boston.

Technical session will include discussions on handling cryogenic fluids with emphasis on use in New England's electronics industry; and safe practices with respect to oxyacetylene applications and equipment.

(More news on page 102)

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H3-AP

Straight Shell Vulcanized Fiber
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Shown: non-conductive plastic holder.

H-80AP

Straight Shell Fiber Glass
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H9-A

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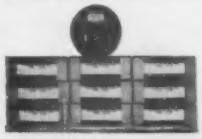
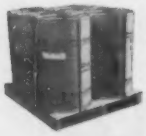


Cartons and spools both have new labels

Both the grade and color-coded stripes are printed on coil liners



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NEW YORK COLISEUM
APRIL 18, 19, 20, 1961

WELDING SHOW

SEE the New PAGE color-coding system demonstrated at Booth 402

Your April, 1961 *Weld World*

As WE went to press, these were the industry's latest developments:

. . The entire gamma radiographic equipment line of Radionics, Inc., Norristown, Pa., will be marketed in the United States and Canada by Philips Electronic Instruments, Mt. Vernon, N. Y., under the latter's Norelco name. Radionics will continue to market independently its new line of nuclear gages — Micro/Meter.

. . Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. has acquired the abrasive and grinding wheel business of U. S. Rubber Co. In addition to its own line, Manhattan's abrasive wheel department will now make grinding wheels with the same rubber and resin bond formulas and equipment as those formerly made by U. S. Rubber.

. . A readily weldable 18% nickel steel with yield strength above 250,000 psi has been developed by The International Nickel Co., Inc. Inco calls the high-strength material "revolutionary." More on this metal next month.

. . In the latest of several recent expansion moves, American Cryogenics, Inc., San Francisco, has purchased the Santa Fe Springs, Calif., industrial gas properties of Burdett Oxygen Co., Cleveland. Burdett also plans to sell or lease its Huntington Park and Burbank sites, and will concentrate expansion activities in the Midwest.

. . If stockholders approve, Midwest Piping Co., Inc., St. Louis producer of piping and welding fittings, will become a division of Crane Co., Chicago. Transaction would involve purchase of Midwest's physical assets only with officials planning to continue the firm as Midwest Investment Co.

. . Early industry-wide figures indicate that structural steel sales appear to be coming out of their doldrums. Figures point to an increase in bridge contracts and commercial structures, according to James M. Straub, president of the American Institute of Steel Construction.

. . A high-current density process for welding aluminum has been announced by Kaiser Aluminum & Chemical Corp., Oakland, Calif. Similar to the square-butt Mig method reported in January (p. 75, WE), Kaiser's also eliminates use of bevel edges in plate up to 1 1/4 in., but the firm recommends bevels on thicker plate. On any thickness, only two passes were made — one on either side.

. . Jackson Products Co. has moved into a modern facility at 5523 E. Nine Mile Rd., Warren, Mich. The Airco division's new plant has 195,000 sq ft of floor space . . . double the amount of the former site at 31739 Mound Rd., Warren.

DATELINE: *Washington*

The tug-of-war of ideas on Capitol Hill has become quite grim, as spokesmen for principal business groups figuratively have gone into the pit to do battle against those administration proposals they view with antipathy.

A nationwide propaganda battle is being waged simultaneously by many groups, each favoring a different approach to the nation's economic problems. Those favoring change are pitted against businessmen who are chagrined at the steady drumfire of pessimism which they feel will do more harm than good.

Business spokesmen have thrown both bouquets and brickbats at the Kennedy administration, and portions of its legislative program, in past weeks.

The biggest bouquet has been for the President's appointments, which are generally accepted in some business circles and hailed in others. The President also has won plaudits for his expressed intention to sponsor some type of business tax relief to spur capital spending. Although Mr. Kennedy has been quite vague about what he favors in this field, one of his task forces made it clear that giving businessmen the use of tax-free profits to earmark for capital expenses might serve to accomplish several worthy economic goals.

However, just what form the tax relief legislation will take, and what its substance might be, remains to be seen.

Bills have been sponsored by various legislators to enable businessmen to retain up to $30,000 a year out of profits, or 20% of their total profits, whichever is the lesser, on a tax-free basis if used for capital purposes. Still other proposals call for faster depreciation on capital installations or equipment purchases.

So far, business spokesmen have concentrated their brickbats on certain phases of the Kennedy program, while ignoring much of it as "so much fluff." The Republicans take the position that they are in favor of most of the goals the President favors. They do not interpret their differences with the Democrats as ideological, but merely differences over amounts.

The hardest blows by business have been struck over the bill to increase the minimum wage from $1-an-hour to $1.25-an-hour over the next three years. Although many (perhaps most) workers already earn far more than $1.25 an hour, businessmen feel that any pressure to push up the wage rate for the lowest group of workers will exercise subtle, but certain, pressure on wages generally. Labor does have its hierarchies, and differentials, just as do other social organizations. If the differential narrows between the low-paid worker and the higher-paid worker, then the latter demands "more." Since this type of worker usually is in the most tightly-knit labor union, he generally gets what he demands, too.

Dr. Emerson Schmidt, chief economist for the U.S. Chamber of Commerce, warned Congress that the higher minimum wage would cause more unemployment, not a lessening of it. He pointed out that all higher wages speed the process of automation, which in turn leads to more unemployment.

Business spokesmen, too, are critical of the administration's proposals to retain the 4-cent-a-gallon federal tax on gasoline (although the Congressional cutoff date is set for July 1, 1961). They are also opposed to most of those Kennedy projects which, eventually, would lead to higher social security taxes, on both the employer and employee.

The outlook still seems to be that President Kennedy will get a lion's share of the legislative package he has sent to Capitol Hill.

* * *

"Little Wagner Acts" and "Little Taft-Hartley Acts" in 12 states and Puerto Rico are analyzed in a study, State Labor Relations Acts, just released here by the U. S. Department of Labor. Copies are available, for 20 cents each, from the U. S. Superintendent of Documents, Government Printing Office, Washington 25, D.C.

State interest in such labor laws has increased since Congress passed the Landrum-Griffin Act in 1959, which among other things authorized the states to exercise jurisdiction over "no-man's land" cases. These mostly involve interstate commerce but have not received federal attention because they do not meet the National Labor Relations Board's jurisdictional yardstick.

While both types of state acts guarantee employees the right to organize and to bargain collectively, the chief distinction between them lies in the little Taft-Hartley Act's declaration of unfair labor practices by unions and employees, as well as by employers as provided in the little Wagner Acts.

Principal areas treated in the 39-page study are coverage of the acts in terms of state jurisdiction and exemptions, plus provisions governing representation procedures, unfair labor practices and union security. The study covers jurisdictions for Colorado, Connecticut, Hawaii, Kansas, Massachusetts, Michigan, Minnesota, New York, Pennsylvania, Rhode Island, Utah and Wisconsin.

* * *

The U. S. Department of Commerce is undertaking a series of studies on the location requirements of selected growth industries to help in rehabilitating depressed areas, Commerce Secretary Luther Hodges has announced here.

These studies, directed by the Office of Area Development of the Business and Defense Services Administration, are designed particularly to provide development organizations in chronic unemployment areas with information which will permit them to evaluate their resources and market capabilities in light of the needs of industries with strong expansion possibilities.

Among industries primarily to be studied are fabricated plastics, the container industries, industrial electronics and others which have shown growth possibilities. A spokesman said it was entirely possible that the welding industry would come within the scope of the study eventually, if not immediately.

The full range of location factors pertinent to each industry selected for study will be considered, including growth trends, present locational patterns, recent geographical shifts, markets, raw materials and supplies, transportation and utility requirements, and site possibilities.

* * *

Labor relations experts here feel that the nation is entering a new era of labor-management "peace," although some say it may be characterized more as a "cold war."

In any case, actual work stoppages in January numbered only 170 throughout the 50 states, the lowest number for that month since World War II ended, according to the Bureau of Labor Statistics, U. S. Department of Labor.

These stoppages idled about 80,000 workers. Some 20,000 other workers were involved in 130 stoppages which began in December and continued for one day or more into January. Total strike idleness in January, at 700,000 man-days, was substantially less than either January, 1960 or January, 1959, both of which had set new records for labor peace, compared with Januarys of postwar years.

Former Labor Secretary Mitchell, reporting on new stratagems developed by his department and the Congress in recent years, had predicted that 1961 would see fewer losses, due to strikes, than in any year in the last 40, as a percentage of the total number of man-hours being worked.

SUREWELD WELDING RODS have long been preferred by metal fabricators. A leading automobile manufacturer uses Redifluxed® No. 30, a pre-fluxed, low cost, high quality bronze rod for braze welding light gauge steel.

When welding is *Sureweld*® Electrodes, Welding Rods and Wire meet the test

The critical jobs . . . those that demand unusually high performance under exacting conditions, that require *extra* ability-to-perform . . . put fabricating methods, equipment and materials to the real test.

It's on jobs like these that SUREWELD electrodes, welding rods and wire prove they are *built-better* to do *better-work*. Each are manufactured under a program of exacting quality control, beginning with testing of raw materials and continuing through every step in production to final testing of the finished product.

Find out what SUREWELD electrodes, welding rods and wire can do for you. Ask your nearby NCG Sales Office, Distributor or Dealer for SUREWELD Data Sheets giving complete and detailed information on each SUREWELD product and its applications.

Also, write today for the new NCG Electrode Data Book . . . an informative 20 page catalog to help you in choosing the correct electrode for any application. Ask for NH-644-E-2D. NATIONAL CYLINDER GAS DIVISION OF CHEMETRON CORPORATION, 840 N. Michigan Avenue, Chicago 11, Illinois.

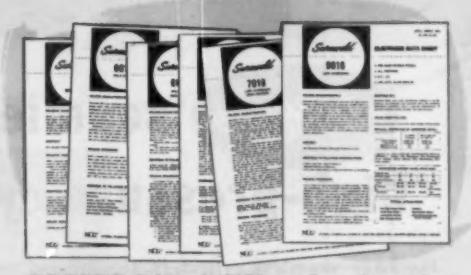
NCG sales offices, distributors, and dealers in all principal cities. Consult the "Yellow" pages for the one nearest you.

NCG, SUREWELD, DUAL SHIELD, REDIFLUXED are Trademarks
©1961, CHEMETRON CORPORATION

SUREWELD ELECTRODES are used for all kinds of jobs. No. 6013, developed for welding light and heavy gauge steel, provides equally good results when welding vertically down, overhead, horizontal or flat fillet welds.

SUREWELD WELDING WIRE is rapidly growing in use. A heavy equipment manufacturer has cut production costs with the Dual Shield, CO_2 automatic and semi-automatic, welding process, and No. 111A multiple-pass wire for welding mild steel.

critical



SUREWELD DATA SHEETS . . . Complete, detailed information; welding characteristics, welding procedures, color identifications, physical properties of deposit metal, etc.

NEW ELECTRODE CARTON . . . Strong, moisture-resistant carton for maximum protection. Also, a new zipper opens carton easily, about one-third comes away and the remainder provides excellent temporary storage.

NEW ELECTRODE SOUND, COLOR STRIP FILM —"How to Select an electrode" is available from your nearby NCG sales office. See it soon.

NCG®

NATIONAL CYLINDER GAS

Division of CHEMETRON *Corporation*

For more facts Circle No. 158 on Welding Info-Aid Card

Hackney seamless high-pressure cylinders

Hackney seamless cylinders are formed from a single disc or billet so that the bottom is integral with the cylinder walls. There's little chance for leaks. They are ideal for shipping, storing and dispensing oxygen, argon, nitrogen, hydrogen, carbon dioxide, compressed air and many other compressed gases.

And because all Hackney cylinders are made the cold drawn way, surfaces are smooth inside and out, with crevices, hollows and ridges eliminated. Cleaning and painting time is reduced throughout the life of the cylinder.

Manufactured in strict compliance with specifications which exceed ICC requirements, Hackney cylinders are finished to your order as specified. For complete details, ask for a copy of the new Hackney cylinder catalog. It gives up-to-date information for all your cylinder needs. Write for your free copy today.

Pressed Steel Tank Company
Manufacturer of Hackney Products Since 1902
1456 South 66th Street, Milwaukee 14, Wisconsin
Branch offices in principal cities
CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

Letters

World's Fair editorial

I was delighted to read your excellent editorial in the February issue of WELDING ENGINEER promoting the idea of a welding exhibit at the New York World's Fair.

Currently, a questionnaire is being answered by the Manufacturers Committee members on this idea of the World's Fair, and your editorial is very timely.

I appreciate, very much, your taking the stand you have, and perhaps it may get some people's minds off of dead-center, and in favor of this idea.

A. V. Scherer
Air Reduction Sales Co.
New York City

Oxygen issue

As a subscriber and reader of WELDING ENGINEER, I want to congratulate you on your very fine feature article on oxygen appearing in the February issue. It was most comprehensive, complete, and very interesting.

However, there is one slight complaint I wish to make. You omitted the name of Texas Oxygen Co., Houston, Tex., in your list of oxygen producers and suppliers. Texas Oxygen Co. has been manufacturing in Houston a little over four years now.

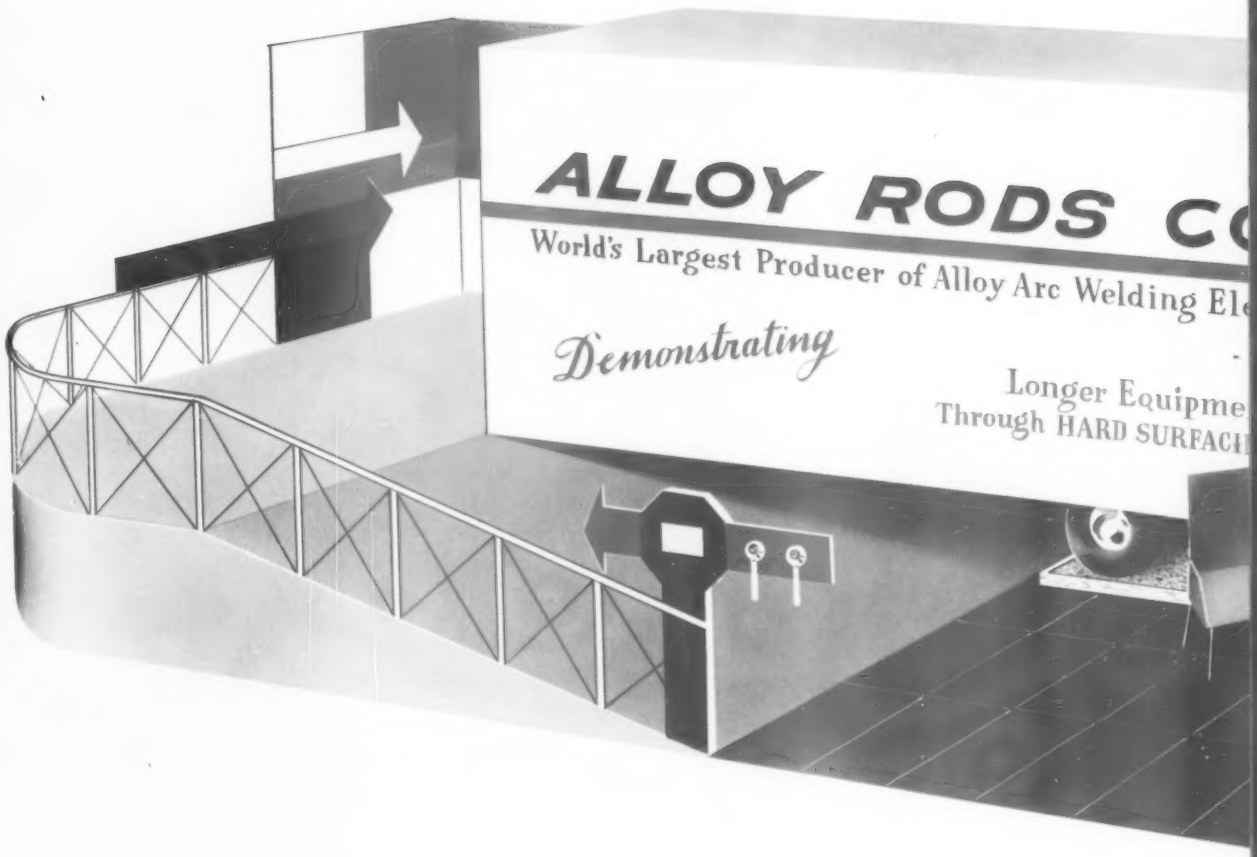
We would appreciate it if you would add our name to your list of oxygen producers in any future articles.

P. G. Grenader
Texas Oxygen Co.

(*Texas Oxygen Co. has been added to the oxygen producers listed in* WE's *Mid-June Fact File on which the February listing was based. Also see page* 102. — *Ed.*)

Want a better understanding of Hard Surfacing

Here's how Alloy Rods Company
Brings the answers to you . . . .

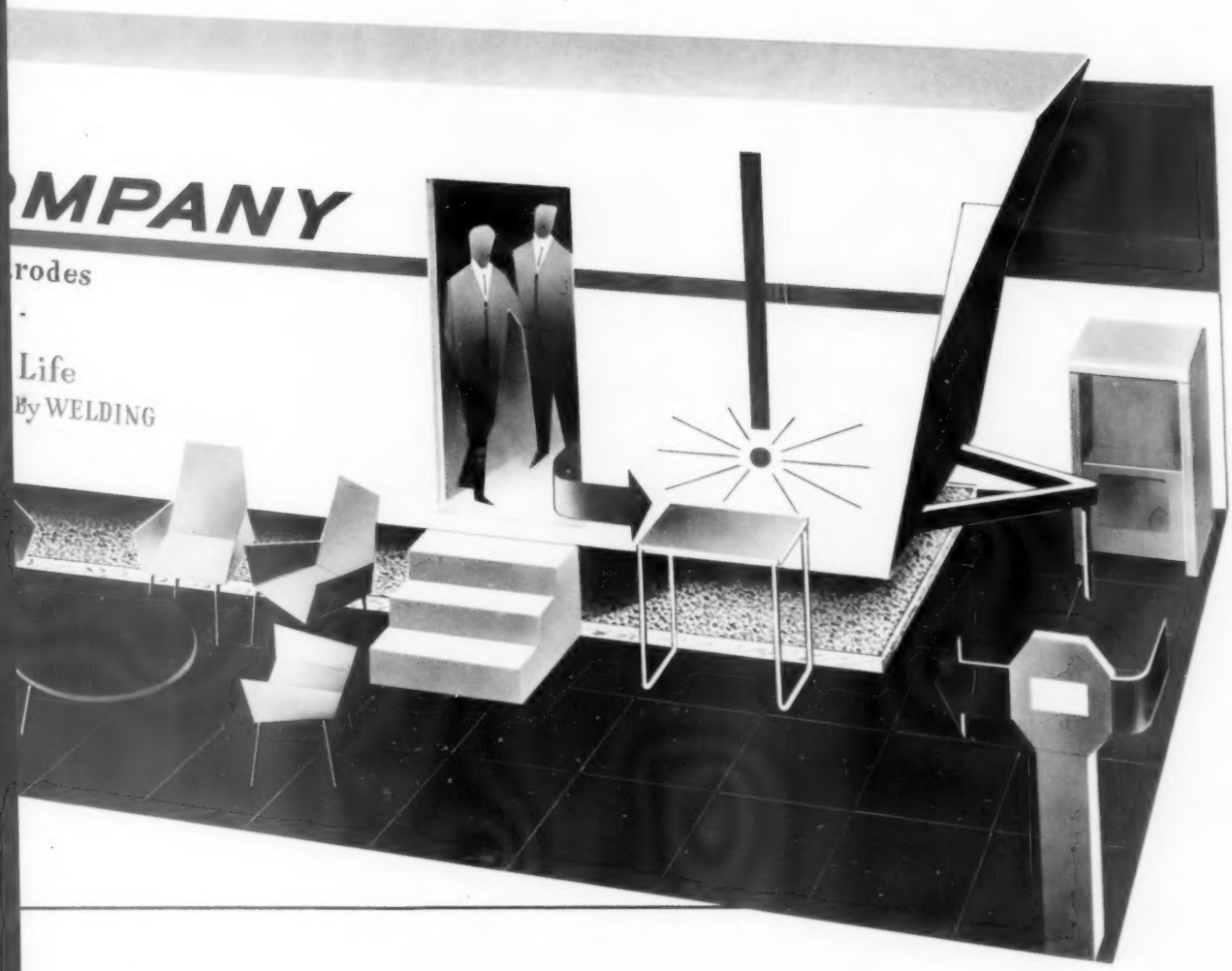


VISIT
BOOTH
601

AWS WELDING SHOW
NEW YORK COLISEUM
APRIL 18, 19, 20

See . . . . . .

Learn . . .



This unique mobile welding lab and instructional trailer designed and equipped especially for the purpose of providing a more intelligent approach to the selection and application of wear resistant alloys . . . *at your shop or business.*

• • • How this free educational service is available to you. Drop in at booth 601, an Alloy Rods Company Representative will gladly show you the facilities inside the trailer and explain its function in relation to your particular operation.

VISIT BOOTH 601

The booth where you have the most to gain . . . the market place of creative, enduring contributions to the field of alloy arc welding. This is your welding show headquarters for information on these outstanding welding products.

ARCALOY Stainless Steel Electrodes

ATOM · ARC Iron Powder Low Hydrogen Electrodes

BARE STAINLESS STEEL WELDING WIRE

BRONZE-ARC Phosphor Bronze Electrodes

NICKEL-ARC Electrodes for Cast Iron

TOOL-ARC Electrodes for welding Tools and Dies

WEAR-ARC Hard Surfacing Electrodes

WEAR-O-MATIC Wire Feed Unit

WEAR-O-MATIC Hard Surfacing Wires for Open Arc Semi-Automatic Applications

WEAR-O-MATIC Hard Surfacing Wires for Submerged Arc Automatic Applications

Alloy Rods Company

P. O. BOX 1828 • YORK, PENNSYLVANIA

SALES OFFICES & WAREHOUSES, BOSTON, NEWARK, PHILADELPHIA, PITTSBURGH, BIRMINGHAM, CLEVELAND, CHICAGO, SAN FRANCISCO & EL SEGUNDO, CAL.—DISTRIBUTORS IN ALL OTHER PRINCIPAL CITIES

Between passes

easier for you

In order to make the services of WELDING ENGINEER more readily accessible, we have redesigned the Welding Info-Aid cards bound into the back of each issue. For your convenience, a flip-out card, whose numbers can be circled while you read the advertisements and the new products section, has replaced the previous type of reader service card. The free literature section is on the page opposite the new card, and the advertisers' literature is listed on the main portion of the insert containing the Info-Aid cards.

Other innovations will be evident as you read this issue. Many of them have been made at your behest. Recent studies by the Research Department of Welding Engineer Publications, Inc., have prompted, for example, the relocation of the new products section to the front of the magazine. The new headlines atop these items are another result of these studies.

All the changes planned have not been completed this month, but should be within the next issue or two. We hope you like them. You should. They were suggested by you — our readers.

KAMINSKY

FARRAR

WE editors

We'd like to introduce the newest members of our editorial staff. **Stuart Kaminsky,** who was appointed news editor of WELDING ENGINEER several months ago, is a graduate of the University of Illinois. He holds two degrees — a B. S. in journalism and an M.A. in English. His previous experience includes work as bureau assistant for United Press International Newspictures in Chicago and Milwaukee and as a general assignment reporter for weekly newspapers in the Chicago area.

In order to give its readers on-the-spot coverage, WELDING ENGINEER has appointed **Larston D. Farrar** as its Washington, D. C. editor. Farrar, who has offices in the National Press Building in the nation's capital, will (among other assignments) provide material for our new department, "Dateline: Washington," which made its debut in the March issue.

Farrar has been Washington editor for our sister publication, *The Welding Distributor,* since last August. He has covered the capital scene for 20 years and is a noted business and economics reporter.

"By the way, did WELDING ENGINEER ever publish the article you sent in?

Circle No. 162 on Info-Aid Card

product defects

getting you down?

let us help you...

✓ find hidden cracks with magnetic particle or dye penetrant inspection equipment

✓ find deep-lying defects with x-ray or gamma radiography equipment

✓ see "innards" directly with bright-image fluoroscopes

✓ work out the method at our Industrial Applications Lab

call any local Picker office where a technical expert is always near (see 'phone book) or write

Picker x-ray

25 So. Broadway, White Plains, N.Y.

NEW SINGER SAFETY SHIELD

In the plant or on the job

★ LIGHTWEIGHT ★ RUST-PROOF
★ LOW COST ★ FIRE-RESISTANT
★ ASSEMBLED OR TAKEN APART IN MINUTES WITHOUT TOOLS

Just think of it—no hooks, no bolts, no screws. Ideal for welding, grinding, machining etc. or can be used straight line as a protecting divider. Rust-proof steel frame with heavy fire-resistant duck curtain—attaches in seconds with with heavy duty snap fasteners.

In 4 standard sizes:
18" x 42", 36" x 48", 36" x 60", 36" x 72"

NEW BIG CATALOG
Describes screens in detail. Complete line of work gloves, welding gloves and safety clothing.

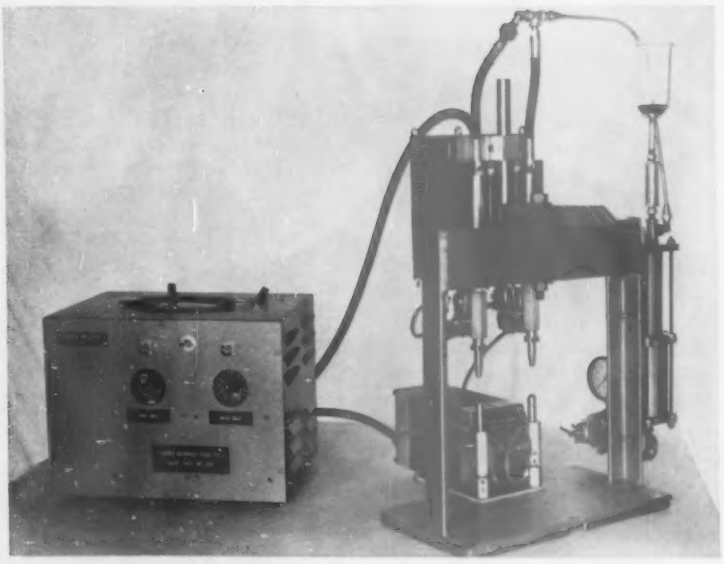
Ask your dealer or write: Special Products Division

SINGER GLOVE MFG. CO.®
860 W. WEED St., CHICAGO 22, ILL.

BOOTH NO. 101 — WELDING SHOW
Circle No. 165 on Info-Aid Card

New products for you

For more information, fold out Welding Info-Aid card on page 123 and circle appropriate numbers as you read.



Unit spot welds through interface coatings, laminates

Unit spot welds through fully-cured or baked-on protective interface coating such as primers, paints and sealants and through laminates such as vinyl clading. Special welders and controls are available. A laboratory version (see cut) is available also. Process involves use of transformer heads with control which provides initial measured preparatory heating under each of four electrodes. Heating removes insulating effect of coating causing it to become plastic or melt. Heating current is established by current flow across sheet between two electrodes and welding transformer on each side. During this phase, polarity between opposing electrodes is of like sign; thus, no circulating of current passes through metal pieces. Instantaneous reversal of polarity of one transformer is automatic after preparatory heating and true controlled current is established through the welding points resulting in two spot welds. This entire process, known as Cooper Reverse-Push Pull Spot Welding, has been developed and applied and reduced to practice by **Cooper Welders, Inc.**

Circle No. 1 on Info-Aid card.

Dual welding system has quick-change tooling

Dual welding machine system welds base, spacers and free stems to diaphragm plates 0.004-in. thick. Welder then seam welds tier of up to 10 plates in pairs. Unit for assembling individual components is 30 kva spot welder tooled with 3 quick-change electrodes. Second unit seal welds sandwich of two phases and spacer. This unit is 10 kva machine fitted with supporting mechanism and tooling. **Thomson Electric Welder Co.**

Circle No. 2 on Info-Aid card.

Brazing alloy now available as powder

Nicrobraz alloys are available as mixture of powder in high-viscosity vehicle. S series is applied by air-gun method for production work or manual syringe for smaller jobs. Alloying time is effectively reduced 50% with new alloy form, according to firm. **Wall Colmonoy Corp.**

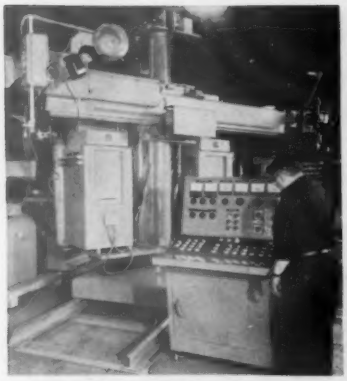
Circle No. 3 on Info-Aid card.

A-c/d-c welder features high-frequency equipment

A-c/d-c welder has adaptable auxiliary equipment for use on any welding job. Silicon rectifier model TR 300-amp operates from single phase a-c or straight or reverse polarity d-c. Welder features built-in high frequency Tig equipment. Intensity controlled by stepless rheostat. Water and gas controlled automatically by solenoid valves. **Westinghouse Electric Corp.**

Circle No. 4 on Info-Aid card.

You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.



Lab unit handles Mig, Tig, submerged arc

Automatic welding unit for laboratory use consists of: heavy-duty ram-type manipulator mounted on variable speed travel carriage; seam welding fixture; Mig, Tig, submerged arc equipment; six channel recorder; and control console. Operator has complete automatic control of all components. Welding head can be positioned and run on side beam track. Manipulator provides 6-in. vertical adjustment, 9-in. horizontal variable speed ram travel and 360-deg rotation. Welding heads at either end of ram may be positioned over seamer. Can handle any weldable material from 0.002 in. to heavy plate. **C. B. Herrick Mfg. Corp.**

Circle No. 5 on Info-Aid card.

Torches feature built-in pilot flame

Where work is intermittent, built-in pilot flame makes it unnecessary to turn down working flame or shut off torch when laying it aside temporarily. Also eliminates need to relight torch after each interruption. Two simple controls are only moving parts. One is main on-off knob which also regulates pilot flame. Other is thumb button for controlling size and intensity of working flame. Wooden or brass handles; for use with acetylene or propane. **Acetylene Supply Co.**

Circle No. 6 on Info-Aid card.

Temperature indicators cover 3,000 F range

Pellets indicate temperatures of 2,800 F, 2,900 F and 3,000 F. Total of 94 temperature ratings are available in systematically spaced intervals covering range from 100 F to 3,000 F. **Tempil Corp.**

Circle No. 7 on Info-Aid card.

KEEP JOINT-WEAKENING, GAS-WASTING ACETONE OUT OF THE FLAME

...with a

REGO®

job-tailored gas manifold

Without even realizing it, you may be discharging your acetylene cylinders too fast causing troublesome *acetone* carry-over into the flame! Acetone lowers flame temperature, increases gas consumption and worst of all, affects the quality of the joint. Your best protection against acetone carry-over is a properly designed RegO manifold for *controlled automatic* discharging of acetylene cylinders. And, RegO manifolds save manpower by reducing individual tank handling, conserve space, assure *complete* emptying of tanks, lower maintenance costs.

THIS BOOKLET EXPLAINS MANIFOLDS, HELPS YOU DESIGN YOUR OWN SYSTEM

RegO Manifold Reference and Planning Brochure explains how manifolds work, lists various types and typical combinations. Simplified, exclusive RegO code system shows how to plan your own manifold system according to your particular needs.

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Please send me a free copy of your helpful Manifold Reference and Planning Brochure G-300/GD.

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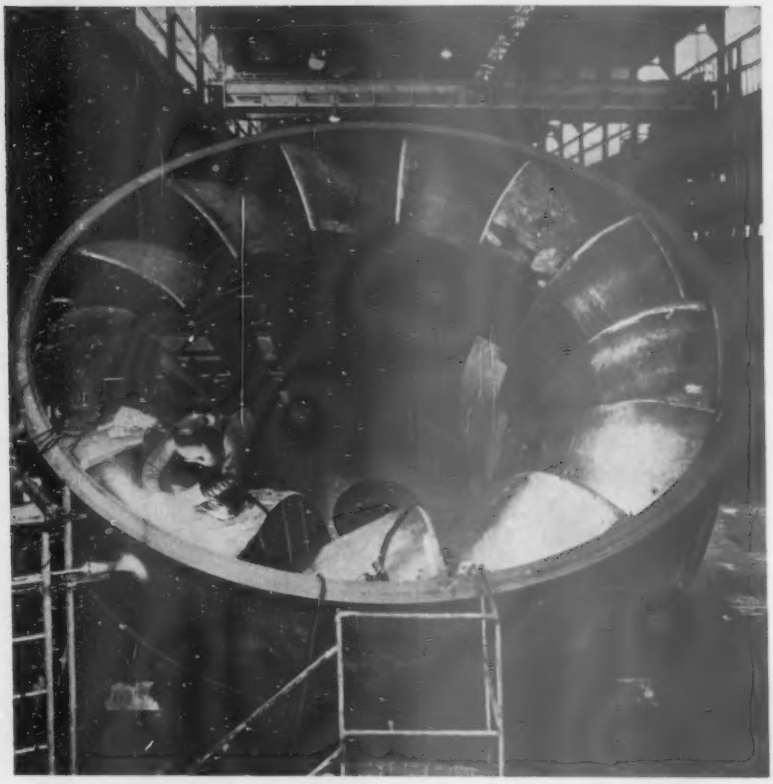
COMPANY_____

ADDRESS_____

CITY, ZONE, STATE_____

WELD WITH ARCOS STAINLESS ELECTRODES



Job Report Courtesy of Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin

Hydraulic turbine runner blades overlaid to resist cavitation. To protect the blades of this huge hydraulic turbine runner from the destructive effects of water wear, Arcos stainless rods were selected for overlaying critical areas. The precise chemical and metallurgical properties of Arcos stainless rods—assuring uniform, predictable results—make this process both dependable and economical. Meet your stainless welding requirements with Arcos—the most complete selection available anywhere.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

Welding booth controls fumes, smoke, flashes

W-200-75 booths can be mounted in single or multiple banks. Booths control fumes, smoke and flashes from arc and gas welding by high-velocity suction and side extensions in case of arc flashes. Booths are suited for training in welding without endangering students from metaloxides. Series of booths may be connected to one main trunk line and suitable blower. **Engwald Corp.**

Circle No. 9 on Info-Aid card.

Strip welder has 25-second work cycle

Automatic tube mill strip welder shears, welds and planishes on work cycle of less than 25 seconds. Mash seam welding is used on special welder to achieve high-speed joining, with high quality and high reliability. Welder accommodates cold rolled steel stock ranging from 0.040 to 0.060-in. thick and 2 to 7-in. wide. Welding power supplied by 30 kva transformer mounted on traveling "C" frame. A 10-hp hydraulic unit delivers 15,000-lb force to planishing rolls and is power source for strip clamping and shearing. **National Electric Welding Machines Co.**

Circle No. 10 on Info-Aid card.

Center wheels designed for right-angle grinders

Reinforced depressed center wheels are specifically designed for use on right-angle portable disc sanders and grinders. Fibre glass layers molded into wheels offer maximum resistance to breakage when properly handled and applied. For safe uniform support, a proper metal adaptor flange is recommended. Designed to cut down and smooth welds on steel plates, pipes and sheets, ferrous and non-ferrous castings. 7-in. wheels attain 8,580 rmp maximum speed. 9-in. wheels attain 6,640 rpm maximum speed. Wheels come with aluminum oxide abrasives and silicon carbide. Standard grit is 24-S, but 36-S and 24-D are available. **Brunmar Commercial Corp.**

Circle No. 11 on Info-Aid card.

Cryogenic pump suited for low, medium ranges

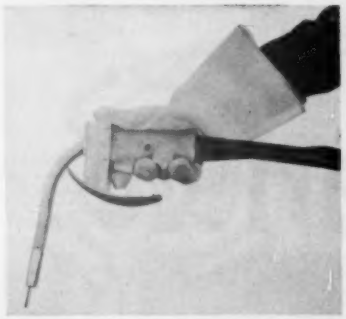
Cryogenic pump is single-cylinder high-pressure unit designed for low and medium flow ranges. Unit delivers liquified gases, such as oxygen, nitrogen and hydrogen, at pressures up to 10,000 psi and flows up to 4.65 gpm. Although compact and weighing only 42 lb, it is designed for commercial and industrial applications. Three separate thermal sections — cryogenic, intermediate and ambient temperatures — separate cryogenic pumping end from lubricated drive end. **The Cosmodyne Corp.**

Circle No. 12 on Info-Aid card.

Electrode eases out-of-position work

Electrode is designed for difficult out-of-position welding in shipbuilding, pipe welding, construction, general maintenance and other areas where weld metal quality is critical. New coating gives strengthened coating crater. Added crater strength improves arc direction in horizontal and vertical working positions to facilitate single and multipass manipulation. E6010 electrode, designated SW 610 by firm, resists breakdown in last half of operation. **A. O. Smith Corp.**

Circle No. 13 on Info-Aid card.



Semiautomatic welder has high desposition rate

Semiautomatic welder is designed for use on machinery and structural fabricating. Unit continuously feeds tubular, self-shielding electrode through welding gun manually supported and guided along joint being welded. Designed to provide high deposition rates of automatic process with flexibility and adaptability of manual welding, 24-ounce gun closely duplicates feel of standard 500-amp electrode holder. D-c motor-generator supplies power for welding range of 350 to 600 amp. **The Lincoln Electric Co.**

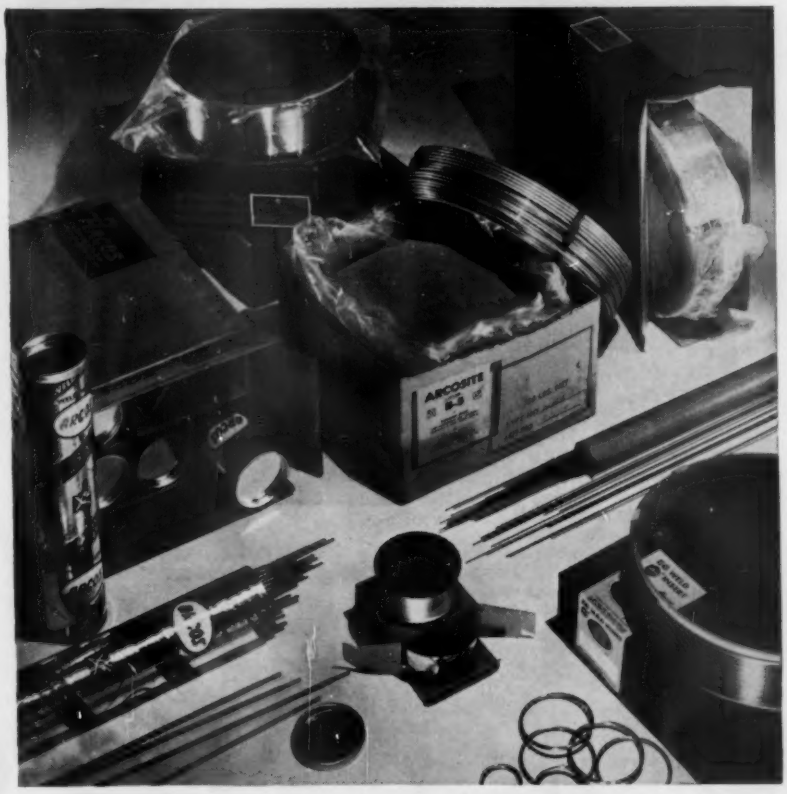
Circle No. 14 on Info-Aid card.

Duct disconnector can be stretched

Soft cuff permits easy disconnection of flexible duct from fitting. Cuff stretches to assure snug fit on nominal size fittings and also permits connection of cuff to end fittings that may be oversized. Made of two-ply neoprene-coated cotton net, cuff resists abrasion, gas and oil. Cuff can be re-used or permanently joined to duct. **The Wiremold Co.**

Circle No. 15 on Info-Aid card.

WELD WITH ARCOS FOR QUALITY WELD METAL



Arcos offers a complete line of filler metals for welding stainless, low alloy steels, mild steels, aluminum, and for hard surfacing . . . manually or automatically. Arcos covered electrodes, electrode wires, and filler rods are available for manual arc, submerged arc, inert gas, CO_2 shielded, and electroslag processes. The quality of all Arcos filler metal products, including fluxes for submerged arc welding and EB Inserts for root pass welding, is carefully controlled. *Make* sure it's Arcos . . . *be* sure of top performance.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

Welding boom manipulator has variable speed car

Welding boom type manipulator features variable speed car and boom. Controls at operator's finger tips with operator's seat mounted at boom end. Power pick-up through bus duct. Power rotation of manipulator column. Welding power units and flux recovery all carried on column platform. Complete freedom at welding end of boom for work rotation and operator control. **Pandjiris Weldment Co.**

Circle No. 16 on Info-Aid card.

Radiation pyrometer measures to 4,000F

Radiation pyrometer measures temperatures to 4,000F in applications such as industrial heating furnaces, open hearth furnaces and rotary kilns. Unit measures intensity of radiation from hot object and converts radiation measurements into temperature measurements. Accuracies within ±1% are achieved. High-signal output of 60 millivolts at 2,200F permits use of a-c type receiver-recorder. Output can be transmitted to recorder up to 500 ft away. **Bailey Meter Co.**

Circle No. 17 on Info-Aid card.

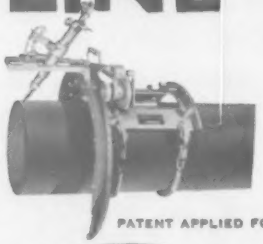
Lightweight dust masks have throw-away filters

Lightweight No. 36 dust masks, packaged in ten unit carton, are pliable aluminum. Inexpensive throw-away sterilized cotton gauze filters are held snugly against face filtering dirt while allowing free breathing and clear speech. Replacement filters, in standard or extra fine filtering, are packaged 25 per tight-closing dispensing box. **Dockson Corp.**

Circle No. 18 on Info-Aid card.

cut bevel grind

with the H & M LINE



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There's an H & M Machine for every pipe cutting need. Write for a complete catalog and price list on H & M equipment today!

STANDARD MACHINES • OUT-OF-ROUND • SHAPE CUTTER
Seven H & M Machines are designed to cut and bevel any size pipe from 1½" to 36". Out-of-Round cuts egg-shaped pipe accurately, and the Shape Cutter fabricates tees, els and other irregular shapes.

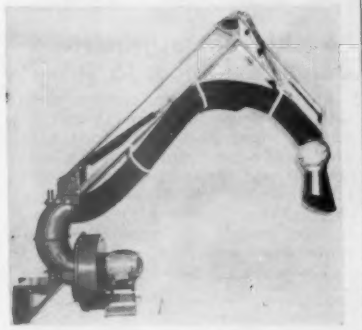
BEVEL-LAND GRINDER
Smooths and cleans pipe cuts and bevels in a matter of seconds. Places the land on bevels quickly . . . accurately . . . eliminates handwork and makes better welds possible.

Accessories
Motorized Units
Flexible Shaft
Pipe Dollies
Boxes/Clamps/Tongs

H&M

PIPE BEVELING MACHINE COMPANY
311 E. Third St. TULSA 20, OKLAHOMA LUther 3-0241
T.M Reg

You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.



Fume exhauster has rotatable exhaust hood

Welding fume exhauster has almost universal flexibility which permits placing rotatable exhaust hood in desired position. Hood may be placed 18 in. above arc. Model 813-E moves on a 9-ft horizontal radius. Vertical range is about 11 ft above floor. Rotatable elbows are heavy cast material mounted on steel brackets which support counterbalance arms made of structural steel and connect to 6-in. hood. Features include fume removal at source, portable operation, counter balance for finger tip control. **Blowers, Inc.**

Circle No. 19 on Info-Aid card.

Waterless soap is quick, harmless

Waterless soap is quick and harmless cleaning agent. No water is required. Hands cleaned instantly. Removes grease, tar, paint and acid stains quickly. Soap is also effective for cleaning painted surfaces, porcelain, glazed tile, etc. **K & W Products, Inc.**

Circle No. 20 on Info-Aid card.

Control clamps at high-pressure

Unit automatically controls pressure. Clamps at high pressure, starts weld at low pressure; then advances to required pressure. Automatically controls weld time in cycles and percentage of heat and all three variables corrected depending on thickness or number of thicknesses to be welded. **Weltronic Co.**

Circle No. 21 on Info-Aid card.

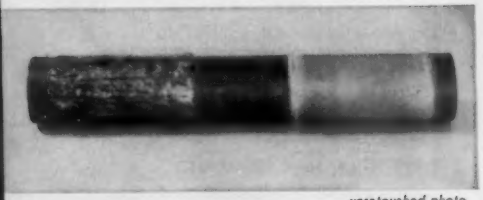
Electric arc gun is six tools in one

Electric arc gun serves as spot welder, stud welder, tack welder, button welder, hole burner and riveter. All metal gun requires no back-up electrode or helmet. Works with any a-c or d-c power supply. Removable special-shaped nozzles reach hard-to-get-at places. Operates with all iron powdered rod stocked by all distributors according to **Beeco Mfg. Corp.**

Circle No. 22 on Info-Aid card.

How flame spraying can pay for itself in your shop in a very short time

ONE EXAMPLE
Hard facing time cut from 4 hours to 25 minutes



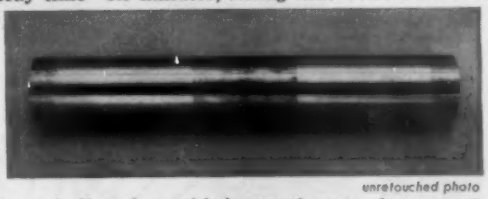
unretouched photo

The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding – time 4 hours; section at right by flame spraying – time 24 minutes, 45 seconds.

QUESTION: Look at the picture. Which end would you prefer to grind finish?

Here's the whole story. We took a 15″ length of 2.5″ mild steel shafting and undercut two 5″ sections .050″ on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5″. Weight of welded-on alloy was 17 9/16 ounces – time spent by one of their top men – 4 hours (including preparation).

Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy – 11 5/16 ounces; surface preparation, set-up and pre-heat – 12 minutes; spray time – 5.5 minutes; fusing time – 7.25 minutes.



Finish-ground shaft – welded section at left, flame sprayed section at right.

unretouched photo

We then sent the shaft out to a grinding shop with instructions to clean up at 2.500″ plus. The flame-sprayed section cleaned up at 2.510″ but welded section still showed pits when grinding was stopped at 2.477″ Rockwell of welded end Rc-61, sprayed end Rc-60.

Pump plunger being flame sprayed with METCO ThermoSpray® Powder Gun

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders – including tungsten carbides – are available for various service requirements; all may be fused–some used as sprayed for certain service requirements.

For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
® *Flame Spray Equipment and Supplies*

1127 Prospect Ave., Westbury, L. I., N.Y. Telephone: Edgewood 4-1300 Cable: METCO
In Great Britain: METCO., Ltd., Chobham-near-Woking, England

FREE BULLETIN

FREE BULLETIN: Send off the coupon for this and other useful information which shows how flame spraying pays for itself–in a very short time. No obligation, of course.

METCO INC.
1127 Prospect Ave., Westbury, L. I., New York

Please send me information on hard-facing by flame spraying.

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

For more facts Circle No. 164 on Welding Info-Aid Card

Automatic CO_2 process welds steel plate

Automatic process combines clam shell forming and CO_2 arc welding to permit fabrication of cylinders from steel plate. Argon and submerged arc can also be used. Production rates up to 125 units an hour are claimed on 6-in. high cylinders of 3/16-in. stock. Pneumatic sequence applied to clam shell jaws controls forming stage. **National Electric Welding Machines Co.**

Circle No. 23 on Info-Aid card.

Helium leak detector permits quick location

High-sensitivity dual-range helium detector permits quick and precise location of leaks in tanks, piping and other fittings. Two-range feature permits high-sensitivity pick-up of small leaks while minimizing overdrive of meter on large leaks. Unit can be calibrated for use in detecting hydrogen and other gases. **Industrial Instruments, Inc.**

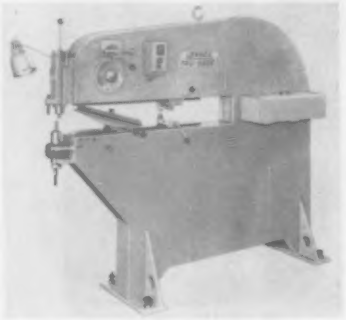
Circle No. 24 on Info-Aid card.

Flame-spray unit hardfaces, metallizes

Model F Spraywelder is medium-capacity high-efficiency hardfacing unit. Unit is designed for application of firm's hardfacing powder on wide variety of metals and alloys. Also suited for flame-spray metallizing with broad range of materials. **Wall Colmonoy Corp.**

Circle No. 25 on Info-Aid card.

You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.



Machine cuts metal without starting hole

Model TE-250 MetlMastr will cut in center of 1/4-in. mild steel plate without a starting hole. Unit also has variable stroke mechanism which is easily and accurately adjustable for cutting various gages of mild steel, stainless steel, aluminum or copper. Cuts at rate of feed up to 36-ft per minute. **Lennox Tool and Machine Builders.**

Circle No. 26 on Info-Aid card.

Portable angle grinders weigh less than 15 lbs

Angle grinders are sturdy, portable and weigh less than 15 lbs, including wheel guard. Equipped with 2-hp heavy-duty motor for connection to single phase a-c, 110 and 220 volt. Designed for up to 8,000 rpm on 7-in. model and up to 6,600 rpm on 9-in. model. UL approved. **Brunmar Commercial Corp.**

Circle No. 27 on Info-Aid card.

Electrode coating eliminates peening

A-c/d-c 11%-13½% manganese-steel welding electrode has all six vital alloying elements in steel core, not in flux coating. In addition, coating eliminates peening and bead-weaving. Sound stringer beads can be run out of position with small diameters. Electrode can be used to weld manganese and mild or high-carbon steels as well as manganese steel to manganese steel. **Stulz-Sickles Co.**

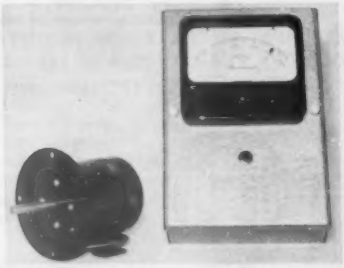
Circle No. 28 on Info-Aid card.

Rexarc
"KING OF THE ARC"
FOR REBUILDING YOUR WORN CRAWLER UNDER-CARRIAGE PARTS, AND DIVERSIFIED WELDMENTS
Automatically
A ROYAL SERVICE CAN BE YOURS
Revolutionary engineering design eliminates the unnecessary... Built-in versatility secures your present and future rebuilding needs... Minimum day-to-day operating costs... Thorough operator training at no additional cost... One source of supply for you—manual and/or automatic!
A ROYAL WELCOME AWAITS YOUR REQUESTS
Rexarc INCORPORATED
West Alexandria, Ohio. U. S. A.

Power shear features fast cutting action

Power shear features cutting action in 1/5 of a second. Ferrous and nonferrous material can be sheared up to 50 in. widths and as heavy as 16-gage mild steel at up to 160 strokes per minute. Speed makes Power Shear No. 48 adaptable for use on conveyor and run out lines. Self-adjusting electric clutch built into flywheel and connected to motor by triple v-belt drive makes instantaneous cycling possible. **O'Neil-Irwin Mfg. Co.**

Circle No. 29 on Info-Aid card.



Indicator systems show motor rotation speed

Tachometer indicating systems use permanent magnet field d-c generators. In conjunction with generators, meters indicate speed of motor rotation and/or process variables. Generator supplied with base and flange-mounted arrangement for mounting to motor by direct shaft coupling or by pulley arrangement as best suited to application. Unique circuit arrangements can be provided in various configurations. **Electro-Devices, Inc.**

Circle No. 30 on Info-Aid card.

A-c/d-c welder has continuous current control

Model MD a-c/d-c welder comes in 300, 400 and 500-amp sizes. Features include: continuous current control, open circuit of 80 volts in both a-c and d-c plus two welding currents in each, straight or reverse polarity, and semi-metallic rectifier. Unit has forced draft ventilation, dead front construction and sturdy drip-proof cabinet. **Miller Electric Mfg. Co.**

Circle No. 31 on Info-Aid card.

ALL THIS and NO EXTRA COST! Why settle for LESS?

Helmet QUALITY is FIBRE-METAL'S Trademark!

OVERHEAD ADJUSTMENT to raise or lower crown as needed...with 6-position positive lock. Easy to adjust.
CHECK ALL THESE FEATURES FOR PROOF!
PLASTIC MATERIAL: a) unaffected by moisture, hence no warping; b) conforms easily to all head shapes; c) easy to keep clean, to sterilize ...unaffected by detergents.
NEW RATCHET ADJUSTMENT holds selected size. Designed for gloved hand. Based on Fibre-Metal design used dependably for many years. Widest headsize range!
ALL METAL PARTS ALUMINUM for light weight, durability, corrosion resistance (except necessary bronze and cadmium plated steel springs).
FREE-FLOATING ATTACHMENT permits headgear headband to fit all head shapes perfectly. No side helmet shell pressure on wide heads. No front-to-back pressure on narrow heads. There is no direct connection of headband to helmet shell!
REPLACEABLE SWEATBANDS (snap buttoned) of supremely comfortable Genuine Leather (also in simulated leather). Smooth overlap construction, no annoying wrinkles, padded.
WIDE RANGE FRICTION JOINT. Long lasting, holds helmet up easily, needing only slight nod to return to operating position. Easy to adjust.
CHIN REST is adjustable to 3 positions . . . a real comfort feature, particularly for overhead welding. Also supports helmet shell for longer service life.
4-POSITION HELMET STOP positions helmet for overhead and vertical welding. Easy, positive, no tools required. Allows normal raising of helmet on friction joints.

THE WELDING HELMET WITH THE WORLD'S MOST COMFORTABLE HEADGEAR!

More than 60 styles of helmets to meet all your needs

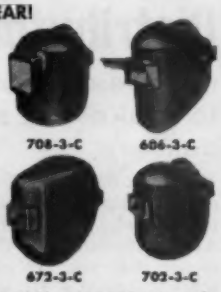
Check overall...and check detail after detail... and you'll see REAL SUPERIOR QUALITY by any comparison! These features *give you the best ...the most for your money!* In value, in comfort, in convenience, in wide versatility of usefulness!

MANY TYPES OF GLASS-HOLDERS, fixed or lift-front, of plastic, steel or Dowmetal. Rugged, light, durable ...and insulated from outside to inside. Leak-proof to light! All glassholder models replaceable for longer helmet life.

QUICK-LOK-equipped Helmet shells are available in all popular styles. Provides quick and easy shell attachment to Safety Caps or the new 3-Q Headgear!

Ask Your Welding & Safety Distributor!
Bulletin No. 73 gives you complete helmet and accessory information.

FIBERGLAS* Welding Helmets



FIBERGLAS shells are seamless, completely opaque†, compression molded of Fiberglas-reinforced thermo-setting polyester resin. With strengthening beaded edges, they are rugged, self-extinguishing, impervious to moisture, easily cleaned and sterilized, allow full ventilation.

VULCANIZED FIBRE Helmets

Vulcanized Fibre Shells, seamless and fabricated, are LOWER PRICED, light in weight, "sealed" against light leakage, allow full ventilation. Other features as above!

*Owens-Corning Trademark
†Even when non-reflective inside coating is scratched!

The FIBRE-METAL Products Company | CHESTER PENNA

In CANADA: Fibre-Metal (Canada) Limited, Toronto

Visit us at THE WELDING SHOW — New York Coliseum — Booth 616

RUSH JOB ON FLAME CUTTING?

Phone your Airco Distributor . . .

He goes out of his way to make that special delivery

You can't make the deadline if you lack gases, equipment or supplies to do the job. So why take a chance? Call your Airco Distributor. He'll break all records to see that you get *all* that you need *when* you need it. His service and practical know how are backed up with Airco's years of welding experience.

For high production or high precision, choose from the **AIRCO** quality line of gas cutting and welding equipment – flame cutting machines – arc welding equipment and arc welders – gas-shielded arc welding process equipment – high purity and rare industrial gases – electrodes – supplies and accessories.

Call your nearby Airco Distributor. He's listed in your Classified Telephone Directory under "Welding Equipment and Supplies."

AIR REDUCTION

. . . represented by over 700 Authorized Airco Distributors from Coast to Coast

Circle No. 168 on Info-Aid Card

Turntable positioner has 1-ton capacity

Model PM-1051 turntable positioner provides motor-driven turntable on which weldments and other assemblies may be mounted for precise positioning and rotation. Assemblies weighing up to 2,000 lb may be mounted on 32-in.-diameter flat machined faceplate and secured to milled T slots. Pre-selected angular positioning of table from vertical to 15 deg beyond horizontal is automatic by simple adjustment. Control knob permits selection of rotation speed from 0 to 4 rpm. **Boesch Mfg. Co.**

Circle No. 32 on Info-Aid card.

Weld viewer replaces helmet

Shielded viewer may be used in any application where operator must have complete visibility of weld, but must frequently remove hood. Model WH6B embodies flip-up front. 6-power magnifier can be installed to enable weldor to follow joint when welding at low amp on thin metal. Model WH-11 4-in. by 5-in. provides 20-sq-in. viewing area. Both models have highly-tanned pliable leather as skirt. **Airline Welding and Engineering.**

Circle No. 33 on Info-Aid card.

Metal cutter needs minimum maintenance

Series of low-cost cutting machines for job shop or production cutting are designed for low initial outlay and minimum maintenance cost. GR series is powered by full 10 hp TEFC motor with high overload capacity. Each unit has miter, notch and coping attachments. **Stone Machinery Co.**

Circle No. 34 on Info-Aid card.

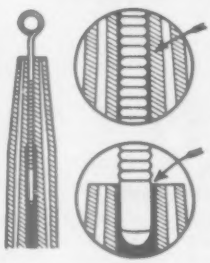
You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.

Let Your Local Welding Supply Dealer Explain Why "YOU GET SO MUCH MORE" *With . . .*

WYPO
Wipes and Polishes *the World's Finest* CUTTING & WELDING TIP CLEANERS

FREE! NEW, SPECIALLY DESIGNED WYPO POLISHING FILE INCLUDED IN EACH SET

More Exclusive WYPO Features



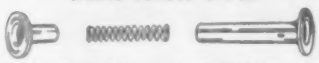
These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

This smooth pilot guides WYPO Tip Cleaner into tip. Will not enlarge or damage tip port.

This cross section view of WYPO Cleaning Surfaces shows these exclusive features: Rounded cleaning surfaces that won't jam or cut.

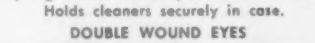
Straight sided valleys insure thorough cleaning by removing all waste.

SPRING LOADED SPOOL



Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

DOUBLE WOUND EYES



Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

STAINLESS STEEL POLISHING FILE

Specially designed WYPO File furnished free in each set

NOW AVAILABLE IN 3 CONVENIENT SETS

WYPO TIP CLEANERS — STANDARD SET

CLEANER NO.	FOR DRILL
7	75-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49

5 S WYPO FILE MADE IN U S A PAT. NOS. 2622981 2673759 IN CANADA 1940

STANDARD SET OF (13) Cleans (27) Drill Sizes Nos. 75 to 49 Incl.

WYPO TIP CLEANERS — JUMBO SET

CLEANER NO.	FOR DRILL
28	48-47
30	46-45
33	44-43
36	42-41
37	40-39-38
39	37-36
42	35-34-33
44	33-31
45	30

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JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

MASTER SET — WYPO TIP CLEANERS

CLEANER NO.	FOR DRILL
7	75-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
33	44-43
36	42-41
37	40-39-38
39	37-36
42	35-34-33
44	33-31
45	30

PAT. NOS. 2622981 2673759 IN CANADA 1940

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MASTER SET OF (31) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

Replacement cleaners and files available. Cleaning Range— Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

SOLD BY LEADING WELDING SUPPLY DEALERS

MAITLEN AND BENSON, INC.
1395 Obispo St., Long Beach 4, Calif.

Circle No. 169 on Info-Aid Card

Compact silicon rectifier medium-power unit

Medium-power-range compact silicon rectifier can be installed at point of use. Ideal for battery charging units, d-c motor control drives, laboratory and aircraft power supplies. Rectifier available in single-phase and 3-phase networks capable of handling from 2 to 7½ kw. Current ratings range from 10 to 25 amp at maximum ambient temperatures of 45 C and up to 75 amp in force-cooled applications. **Syntron Co.**

Circle No. 35 on Info-Aid card.

Tracer handles non-repetitive cutting

Electronic tracer is suited for cutting work of non-repetitive type or where minimum investment in templates is necessary. Aircotron Model "J" Electronic Tracer uses templates prepared by conventional drafting methods. Stepless cutting speed control and tracing of 90-deg corners without need of corner radii. Unit can be used for chain cutting. Unit uses small light-sensitive element in scanning head to follow template line of part cut. Tracer not affected by extraneous light. **Air Reduction Sales Co., Inc.**

Circle No. 36 on Info-Aid card.

Aluminum solder needs no flux

Fluxless aluminum solder melts at ordinary soldering iron temperature. No flux required on aluminum and its alloys, duralumin, pewter, tin and magnesium castings. Can be used on copper, brass, ferrous metals and castings with normal fluxes. Since solder is normally applied at about 210 C, an ordinary soldering iron can be used. Low fusion temperature eliminates overheating of metals to be joined. **Metals for Industry Inc.**

Circle No. 37 on Info-Aid card.

MID-STATES *Magna-Tran*

THE FINEST IN INERT GAS WELDING EQUIPMENT

MODEL
MAG 300 AC/DC T1

FINEST IN RECTIFIERS

Hermetically sealed SILICON DIODE rectifiers are used in the MAGNA TRAN to produce the most efficient DC power conversion known. SILICON is fully guaranteed, will NOT age and assures full rated output for life.

SILICON DIODE
1/3 ACTUAL SIZE

FINEST CONTROL SYSTEM

Exclusive pneumatic timers, simply PLUG IN like radio tubes to provide gas Pre-flow, After-flow, Hi-Frequency Drop Out and Spot Arc control in any combination. Buy timers and plug in as required in the field. Remote Control by either hand or foot control.

FINEST ARC CHARACTERISTICS

New patented saturable shunt design eliminates need for separate reactors or mechanical device and delivers exceptionally stable arc current. On DC SILICON rectifiers produce smoothness you've never thought possible.

FINEST FOR MAINTENANCE

Modular plug in design throughout simplifies any service problem. Hi-Frequency and control components are mounted on removable plug in chassis. Plug in gas-water panel, Silicon rectifiers, line contactor and other parts are easily accessible.

Available in either AC or AC/DC models.

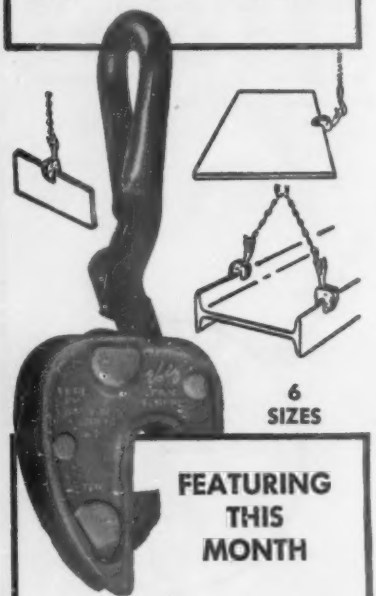
See it at the Welding Show Booth 233

MID-STATES WELDER MFG. CO.

6025 South Ashland Ave. Chicago 36, Ill.

YOUR BEST MOVE . . . MOVE
with **MERRILL**
MATERIAL HANDLING
DEVICES FOR THE MOST
IN *Safety and Economy*

Imitated, but never duplicated, Merrill Lifting Clamps are Drop Forged to give you Safety in Handling and Economy in Operation.



6 SIZES

FEATURING THIS MONTH

AUTOMATIC SAFETY LOCK FORK LIFT ATTACHMENT
Transforms any fork lift truck into a safe, efficient mobile overhead lifting unit.

Over 25 Material Handling Devices described in our catalog C-3.

Ask for a copy.

MERRILL BROTHERS
Producers of Drop & Press Forgings
56-81 Arnold Ave., Maspeth, N. Y.
1-60

Circle No. 171 on Info-Aid Card

Flowmeter regulator

Atmospherically-heated flowmeter regulator is designed for CO_2-Mig welding. Regulator eliminates freeze-up problem in flow control equipment and need for supplementary heat sources. Two-stage regulator has atmospheric heat pick-up element. Regulator will perform satisfactorily in most applications where flow and duty cycles do not exceed 80 ft per hr. Unit consists of chrome-plated pre-set single stage regulator, heat exchange coil, second stage of pressure reduction and float-type variable-area pressure-compensated flowmeter that indicates flow in standard cu ft per hr. *Air Reduction Sales Co.*

Circle No. 38 on Info-Aid card.

Resistance heaters

Electrical resistance heaters for preheat, postheat and stress relief safely attain 1,400 F and higher metal temperatures. Full-length heater elements eliminate "cold spots", make intimate contact with weldments of various sizes and shapes including pipe down to 3-in. diameter. Molded neoprene distribution equipment with polarized plugs and receptacles prevents wrong connections and gives protection against electrical and physical hazards. *J. B. Nottingham & Co., Inc.*

Circle No. 39 on Info-Aid card.

Compact level

Pro-Mag-Level is 9-in. long, 2-in. high, 3/4-in. wide and weighs 10 oz. Pocket-sized level has one side machined to flat plane for flat surfaces, another side machined to slight "V" plane for pipe work. Level body made of strong aluminum casting. Scales imprinted on one end for rise in deg per ft, on other end with rise in deg per meter. Equipped with level and 90-deg dial marked in 2½-deg units held in place by screw with pressure washer for easy setting. Frame of level equipped with two magnets on each plane for holding in desired position. *Contour Marker Corp.*

Circle No. 40 on Info-Aid card.

NOW!

CHOOSE ONE OF 4 WAYS TO REPAIR GALVANIZING . . .

- coating
- stick
- powder
- bar

DRYGALV The "wonder tonic" for all maintenance work, galvanizing repairs. Requires no heat. Gives steel permanent protection against rust and corrosion through its cathodic action. Coating contains 95% metallic zinc. Easy to apply by brush or spray on all ferrous metals — over traces of rust, partially painted surfaces, clean metal, welded joints, galvanized surfaces. Dries in 15-30 minutes. One gallon protects 400 square feet of metal. Meets U. S. Government Specifications for repair of Galvanizing.

AMCO GALVANIZING COMPOUND IN STICK FORM, No. 322

convenient pocket size compound for repairing damaged galvanizing. Easily and quickly applied to surfaces not suitable for powder. Simply heat area required and brush with AMCO stick. Leaves a continuous, uniform, bright and protective coating. Meets U. S. Government specifications for repair of galvanizing.

AMCO GALVANIZING POWDER, No. 321

Makes fast, permanent repairs of all damaged galvanized surfaces. Forms free flowing paste with water, applied by brush. Heat and wipe with cloth. Cleans the surface of all rust and foreign matter. Meets U. S. Government specifications for repair of galvanizing.

AMCO GALVANIZING BAR, No. 3017

In convenient, handy form — ¾" square, 14" long; weighs only 5 ounces. Surface to be repaired needs no cleaning — simply heat the surface, rub AMCO bar over area, then wire brush. No applicable government specs.

Available from your local distributor *or write*

AMERICAN SOLDER & FLUX COMPANY
1903 W. Willard St., Philadelphia 40, Pa.

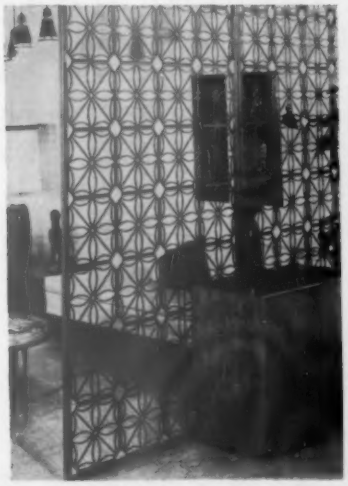
Circle No. 172 on Info-Aid Card

You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.

Tig holder

New H16-A Tig holder is air cooled unit with 160-amp a-c or d-c continuous capacity. Holder provides welding of thin gage aluminum, alloy and stainless steels, brass, copper, magnesium, molybdenum, nickel, silver and other metals. Air-cooled construction eliminates need for water system. Variety of orifice sizes available in 1¼-in. and 1¾-in. lengths. Alumina nozzles provide good thermal and mechanical shock resistance. Tungsten electrodes from 0.020-in. through 5/32-in. diameter and 2 to 7-in. long can be accommodated. *Air Reduction Sales Co.*

Circle No. 41 on Info-Aid card.

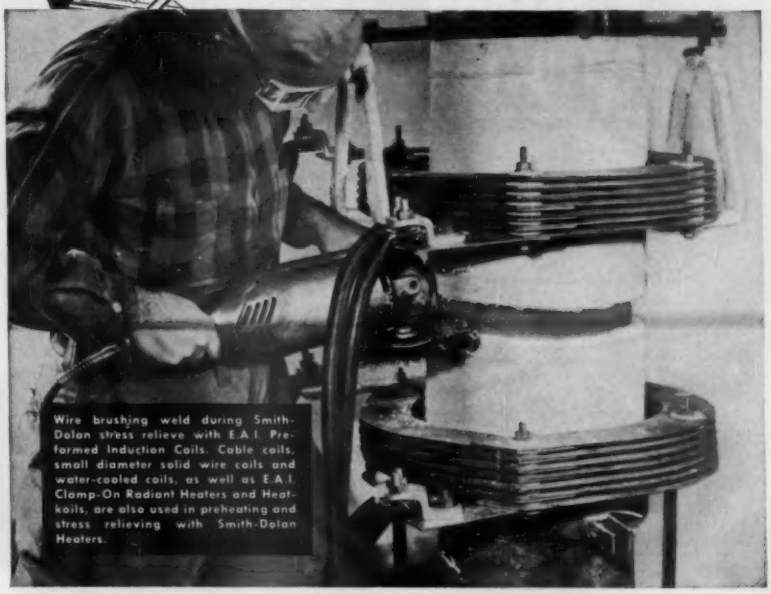


Ornamental metals

Aluminum design units separate space without confining. Units do not impede flow of air and can be painted to blend or contrast with any color scheme. Available in four forms in 12-in. patterns. *Tennessee Fabricating Co.*

Circle No. 42 on Info-Aid card.

Profit through E.A.I. Research



Wire brushing weld during Smith-Dolan stress relieve with E.A.I. Preformed Induction Coils. Cable coils, small diameter solid wire coils and water-cooled coils, as well as E.A.I. Clamp-On Radiant Heaters and Heat-coils, are also used in preheating and stress relieving with Smith-Dolan Heaters.

For Safety, Simplicity and Efficiency In Stress-Relieving Weldments

use proved Smith-Dolan 60-cycle heating

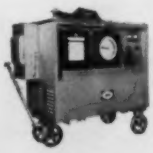
Eliminate Hazards to Personal Safety—No dangerous voltages are involved when using Smith-Dolan 60-Cycle Induction Heaters.

Eliminate Superficial Heating — Gives even, through-and-through heating of wall thicknesses up to four inches and more.

Eliminate High Maintenance Costs—A transformer type machine . . . no rotating parts to wear . . . practically no maintenance needed.

Eliminate Complicated Operation — Self-regulating and voltage stable . . . uses most commonly available commercial voltages . . . on-off operation by inexpensive, durable contactors . . . dual circuit for greater versatility, controlled voltage . . . no technical training needed for expert operation, only a few hours of on-job instruction.

Eliminate Power Losses — 92 to 95% efficient; losses are lowest of all electrical apparatus.



Developed over many years and proved around the world, E.A.I. Smith-Dolan equipment is *designed to meet every stress-relieving requirement with minimum expenditure.* Rental against purchase . . . get first-hand proof in your own plant without capital investment.

Illustrated Brochure on Request

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Representatives in Principal Cities

ELECTRIC-ARC INC.

For more facts Circle No. 174 on Welding Info-Aid Card

HIGHEST YIELD

They mean National Carbide's calcium carbide —gets ten tests!

Always nearby— in the **BIG RED DRUM.** Wire for supplier...

National Carbide is a product of

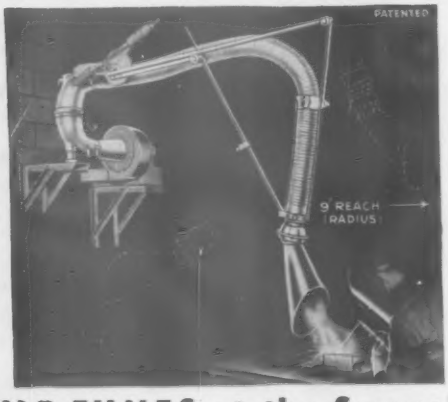
Calcium Carbide

AIR REDUCTION CHEMICAL & CARBIDE CO.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED • 150 EAST 42nd STREET, NEW YORK 17, NEW YORK • MURRAY HILL 2-8700

RUEMELIN Fume Collectors

Welding without ventilation. Note smoke and gas clouds.



(Right) Welding with Ruemelin Fume Collector.

REMOVE WELDING FUMES at the Source!

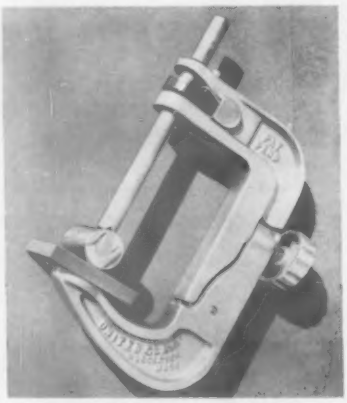
Ruemelin Fume Collectors remove smoke, gas and welding heat. Keep the shop air clean. Efficient and practical. Maximum coverage in welding areas. Your welders work better with this equipment in use. Write for bulletin 37-E describing the new spring-loaded counterbalance mechanism.

Long reach collector extends working range of hood to 15 ft. or 18 ft. operating radius. Double swivel permits hood to work in 360° circle for full coverage.

RUEMELIN MFG. CO.

Manufacturers and Engineers SAND BLAST AND DUST COLLECTING EQUIPMENT

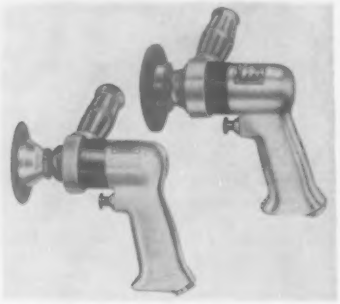
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.



Threadless clamp

Finger-tip control threadless clamp eliminates frame twisting due to tightening. High-tensile strength aluminum alloy clamps come with either anvil or "V" spindles and 2-in., 4-in. and 6-in. sizes. Anvil and spindle do not turn while pressure being applied, so materials are free of clamp marks. Brackets can be obtained to permit use of clamp as bench vise. *United Associates*

Circle No. 43 on Info-Aid card.



Finishing tools

Offset pistol grip handle permitting accurate one-hand control over general duty finishing operations is featured in 31V and 31S series of grinders and sanders. A removable, adjustable dead handle is furnished with each model for more difficult tasks. Sensitive trigger throttle allows slow tool start-up and gradual speed increases for close-quarter weld cleanup or feathering. *Buckeye Tools Corp.*

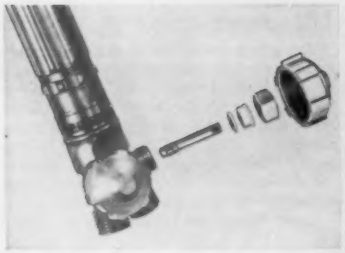
Circle No. 44 on Info-Aid card.

X-ray unit

X-ray image amplifying technique increases by five times previous limits of effective fluoroscopic magnification for industrial inspection. Products previously too small to be tested by this means can now be handled Device permits fluoroscopic images of industrial product to be expanded effectively 20 times original size. Images are reported to be 1,000 times brighter. *Picker X-Ray Corp.*

Circle No. 45 on Info-Aid card.

You can see many of these new products on display at the American Welding Society Exposition to be held April 18-20 at the Coliseum, New York City.



Torch valve

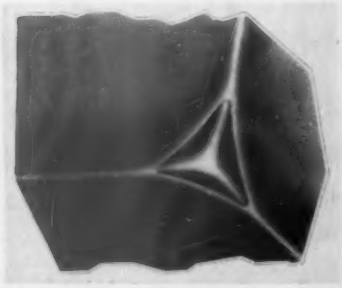
Complete line of welding and cutting torches have new valve systems with streamline design. Concave valve handles let them sit much closer to torch body. Solid brass handles are designed for positive grip control. Handles are permanently press-fitted to valve stems equipped with oversized lifetime packing sleeves of anti-friction teflon. Valve bodies are die-forged bronze with drilled gas and air ports. *Dockson Corp.*

Circle No. 46 on Info-Aid card.

Inspection system

Magnetic particle non-destructive inspection system features 23-lb magnet with capacity of 5,000 amp-turns. Magnet can lift 350 lb. Variac control of d-c magnetic field allows magnet's strength to be changed at will. Variable control allows part to be demagnetized gradually by switching from d-c to a-c and turning control back to zero. *The Budd Co.*

Circle No. 47 on Info-Aid card.



Corner transitions

Spherical corner transition is intended to eliminate square inside corner common to rectangular tanks, bins and other steel containers. Corner furnishes smooth transition from square to round and back to square in any direction inside container. This permits easy cleaning and prevents sediment accumulation and corrosion at these hard-to-reach points. Corner also acts as brace. Units may be welded into existing tanks or used on new products. Corners are available in one standard 3-in. size and will be furnished in two thicknesses of mild steel and grade 302 stainless steel. *Conner Steel Products*

Circle No. 48 on Info-Aid card.

Auto-View welding helmet answers silent commands

AUTO-VIEW is the new welding helmet that allows the welder to look at his work without touching his helmet — automatically, efficiently. You look through either a clear, protective window, or a leak-proof welding filter at will. The window changes at your own silent command.

The operating principle of Auto-View is simple. To remove the light filter, you open your mouth. Under your chin a comfortable pad actuates a mechanism to remove or replace the filter. For a quick look, just open and close your mouth. For prolonged looking, a HOLD button locks the filter out of the way until you start to weld again.

Auto-View is particularly useful in tight places, where it would be difficult to tilt an old-fashioned helmet. In any situation, the Auto-View saves time, makes the welding job easier, and provides greatly increased quality of work. Write for literature.

1424 Fourth St., Santa Monica, Calif. AUTO-VIEW WELDING HELMET CO.

Auto-View wears like any ordinary helmet — is lightweight, provides fully safe light shielding.

Upon silent command (opening the mouth) the light filter snaps up, out of view.

For more facts Circle No. 177 on Welding Info-Aid Card

Get fast, accurate

Tensile Testing

hydraulically

Hydraulically powered Detroit tensile testers put you in command of every phase of the test. Self-acting, open-sided specimen grips permit easy specimen insertion. Constantly controlled hydraulic rams apply up to 40,000 pounds, smoothly and quickly. Special load gauges, grips, or other modifications gladly supplied.

Write today for more information about our tensile testers

DETROIT TESTING MACHINE COMPANY

9380 Grinnell Avenue, Detroit 13, Michigan

Ultrasonic tester

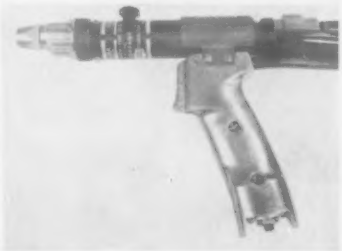
Immerscope is used for ultrasonic nondestructive testing of welds and other bonds. Features include: built-in facilities for high-sensitivity and high-resolution contact testing, variable pulse repetition rate, high-speed flaw alarm circuit, built-in recorder output circuits for direct connection, and built-in video delay circuit. *Curtiss-Wright Corp.*

Circle No. 49 on Info-Aid card.

Galvanizing coating

Galvanizing coating is 95% zinc metal in liquid form. Applied like ordinary paint, it will withstand surface temperatures up to 400 F. It may be used as primer or finish coat. Has been applied to missile launching gantries and radar search unit antennae. *The Wilbur & Williams Co., Inc.*

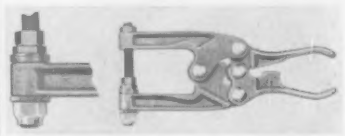
Circle No. 50 on Info-Aid card.



Mig torch

ST-5 Mig torch can be used for spray arc, short arc, plug and spot welding. All service lines enter torch through rear of barrel. Cooling system brings water directly into nozzle body to cool contact tube permitting continuous operation at currents as high as 500 amp even with carbon steel welding wire. Aluminum alloy pistol-grip handle is adjustable along torch barrel and is removable to permit using torch in mechanized installation. *Linde Co.*

Circle No. 51 on Info-Aid card.



Load-indicating clamp

Industrial "C" clamp series permits time-after-time application with predetermined clamping force regardless of thickness of work held. Load-indicating feature is also available in 4 models of pliers. *Lapeer Mfg. Co.*

Circle No. 52 on Info-Aid card.

Brazing alloy

Low-temperature phosphor-copper silver brazing rod develops 50,000-psi tensile bonds with 25% elongation and 1,260 F working temperature. Alloy is recommended for joining all copper alloys. Alloy can be applied by all standard brazing methods. Available in 1/16-in., 3/32-in., 1/8-in., 3/16-in., 1/4-in. by 18-in. rods and 0.050-in. by 1/8-in. strip. Bright Finish No. 23 comes in 1, 10 and 15-lb packages. *All-State Welding Alloys Co., Inc.*

Circle No. 53 on Info-Aid card.

BECKER

HAS IT...OR CAN MAKE IT—

if it's CARBON or GRAPHITE!

A dependable source for everything in Carbon and Graphite

Graphite Cores and Chills—Graphite Powder and Particles of any mesh . . . complete Graphite Fabrication Facilities.

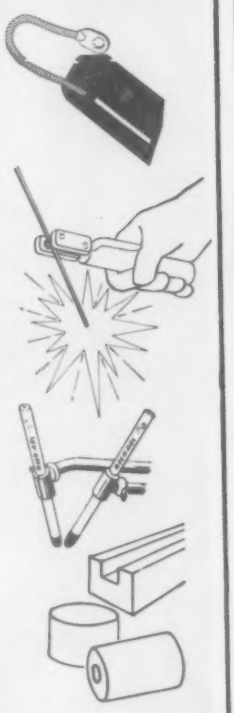
BRUSHES . . . for all motor and generator applications . . . carbon, graphite, copper leaf, gauze and metal-graphite.

WELDING ELECTRODES, WELDER BRUSHES . . . Keen-Cut Electrodes for carbon arc-air jet cutting . . . Keen-Arc Carbons, cored and heavily copper coated, for twin-arc torches . . . paste, rods and plates.

EXTRUSIONS, MOLDED SHAPES OR SPECIAL CARBONS designed and produced to your specifications.

COMPLETE BECKER ENGINEERING SERVICE is always available and entails no obligation whatever

Write for Catalog



BECKER BROTHERS CARBON CO.

3436 South Laramie Avenue • Cicero 50, Illinois • Telephone: BI 2-1260 • Chicago

For more facts Circle No. 178 on Welding Info-Aid Card

For more facts Circle No. 179 on Welding Info-Aid Card →

SHORT ARC

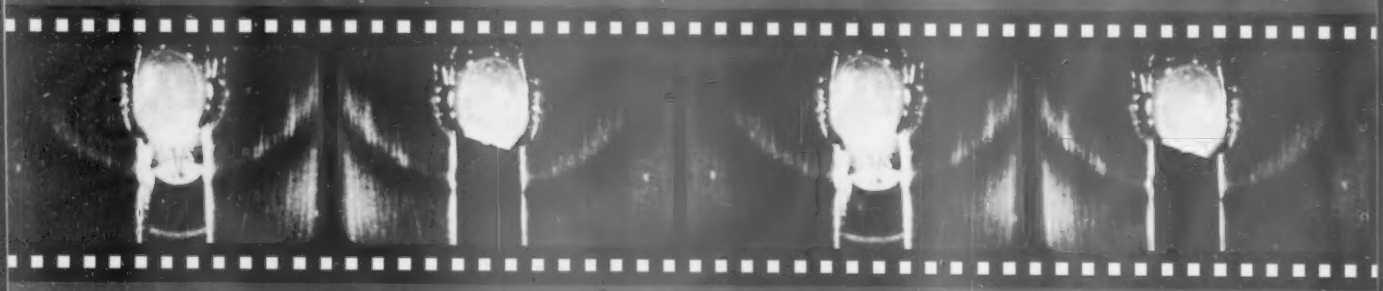
QUALITY SHEET-METAL WELDING

Sheet-metal welding has been possible, but quality welds were difficult and time-consuming. Now, LINDE's new Short Arc process—combining specialized power source characteristics, shielding gas, and semi-automatic torches—easily delivers *quality* and economy

- . . . on all sheet-metal thicknesses
- . . . with minimum distortion—far less than any other process
- . . . tolerating more than 100% gaps—even ¼-in. gaps on ⅛-in. material
- . . . producing 30 ft. of fillet welds for only a pound of wire and four cubic feet of gas
- . . . as fast as 20 inches per minute on 16-ga. sheet
- . . . as easy to control as a ball point pen
- . . . permitting all-position welding with the same settings
- . . . and *consistently* cleaner, smoother, more-uniform welds than any other process.

See the next page for details.

SHORT ARC



Here is a typical LINDE Short Arc weld in the making...

a finished bead, and a weld cross-section...

Notice the intermittent "shorting," the smooth, finished bead, the uniform penetration. No spatter. No clean-up. No finishing. Welders trained in minutes. Short Arc employs precisely controlled, low-voltage pinpoint-arcs shielded by an argon-CO_2 gas mixture. Shorting the arc lets the puddle cool, *minimizing* heat distortion and *controlling* burn-through for ideal penetration. Short Arc works on all common metals and their alloys, on carbon steel, stainless, aluminum and magnesium... on all types of joints... in all positions.

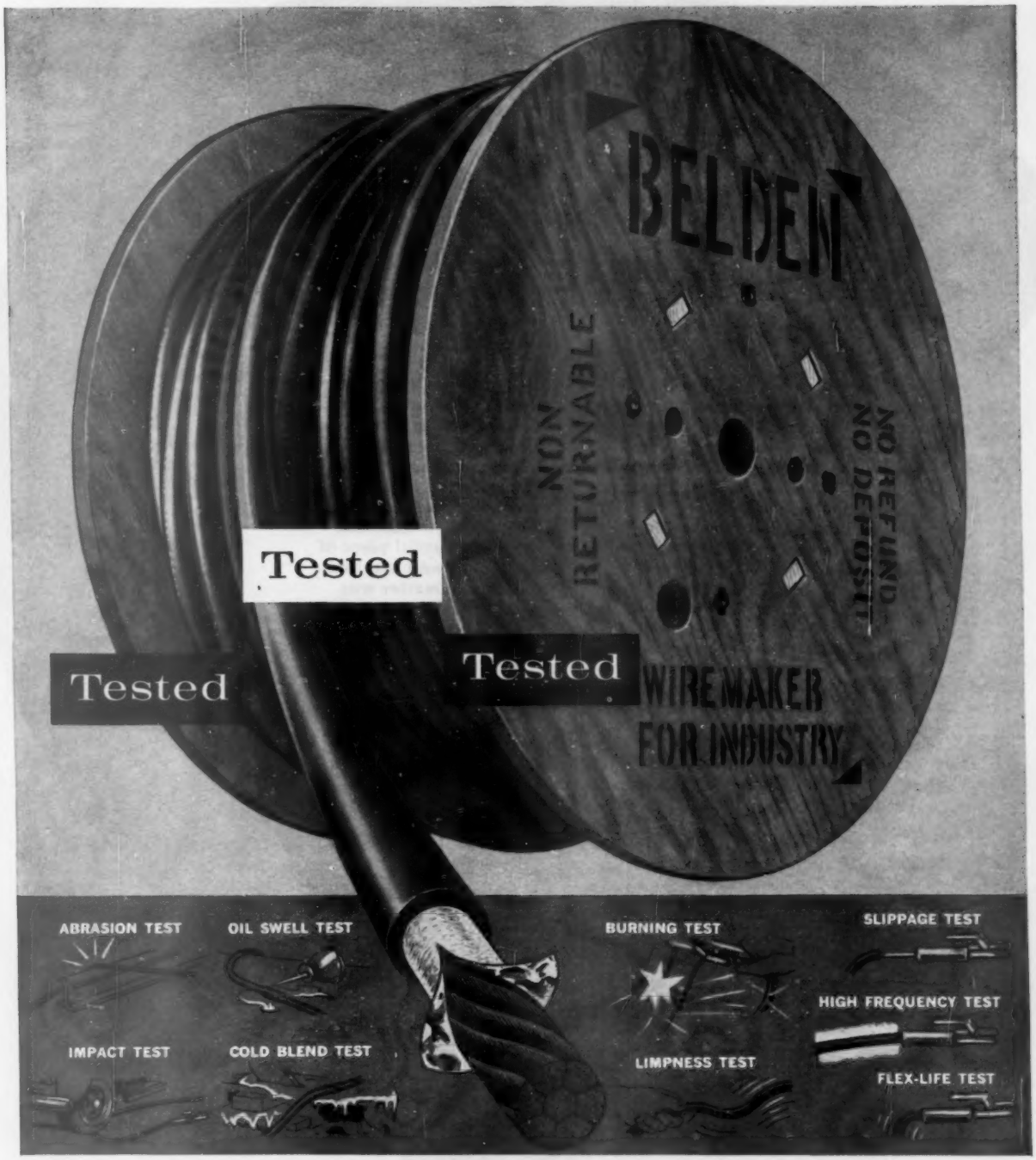
Only LINDE has brought together the ideal combination of materials for welding sheet metal—the SVI-300 power supply, with variable slope, voltage and inductance controls that permit an *infinite* range of settings; the C-25 argon-CO_2 gas mixture that combines with variable slope to reduce heat and *control* penetration; and the ST-2 and ST-4 torches, specially designed for hard and soft wires respectively. There is no substitute for Short Arc. Only LINDE offers the specialized equipment that makes such *quality* sheet-metal welding possible. For more information or a live demonstration, call your nearest LINDE office.

"Linde" and "Union Carbide" are registered trade marks of Union Carbide Corporation

LINDE COMPANY

UNION CARBIDE

Division of Union Carbide Corporation
270 Park Avenue, New York 17, N.Y.



Welding Cable by

By endless testing under every adverse condition, Belden engineers have developed a welding cable with greater limpness, flexibility, and toughness, that provides years of longer service life. And there is a Belden cable for every welding requirement . . Oil Tempered Rubber Jacketed . . Neoprene Jacketed . . HVF Vinyl Plastic Jacketed . . Whip Lead, Super-Flexible and Neoprene Jacketed . . Neocote colors for identification . . Rubber Jacketed Welder Supply Cords.

Available in many ready-to-use packaged lengths
ORDER FROM YOUR WELDING SUPPLY DISTRIBUTOR

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902 — CHICAGO

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18-1-1

DOES IT WELD?

With our great advances in the arc welding process we go to more complex machines, more complex specifications, and more complicated testing procedures. Whenever I walk through our laboratories and see our engineers and scientists making tests, plotting curves, looking at oscilloscopes, and using their slide rules and calculators, it reminds me of an experience I had years ago. I had hired a real bright new engineer and he had just come through with a new welder design. He was real enthusiastic and showed me all the test figures. He had a beautiful piece of electrical equipment. However, he was real shocked and insulted when I asked him: "Does it weld?" The fact of the matter was it didn't weld too well and we never put it on the market.

This points to one obvious conclusion. In spite of the fact that everything is getting more and more complex – quality and performance must never be sacrificed. These are simple things – they must never be forgotten.

So perhaps when we see modern specifications and complex gadgets and when we are tempted to buy on glittering claims, or when we are looking for that bargain price, maybe we ought to stop and ask: "But does it weld?"

Niels C. Miller

NIELS C. MILLER, *President*

MILLER ELECTRIC MFG. CO.
Appleton, Wisconsin

For more facts Circle No. 180 on Welding Info-Aid Card

ESTABLISHED 1916

Too many cooks

THE WELDING INDUSTRY is rapidly becoming a perfect example of that old proverb — "Too many cooks spoil the broth."

The American Welding Society spends its time cooking up various codes and specifications. But apparently they are not keeping ahead of the needs, or at least the demands, for these standards since so many other technical societies are elbowing their way into the kitchen.

There are now some 20 *different organizations adding their oftimes unnecessary codes and restrictions, making the increased use of welding more difficult than ever.*

If a technical society is involved in welding, its requirements should be recognized by AWS and a jointly-sponsored code or specification prepared. Too often, this is not the case. Naturally, confusion results.

The only time there seems to be agreement is when a joining problem is too difficult to accomplish by any other means; then welding is accredited — but the agreement is on the joining method only.

How the welding is to be done, by whom, where, why and when often involves restrictive clauses, asinine ideas and childish thinking.

AWS should act. Generally, there are too many codes, but the few jointly-sponsored welding standards seem to work out well. Perhaps similarly sponsored codes will help clear this confused, multiple-regulated situation now frightening and pricing fabricators out of welding.

Unless AWS does something to gather all the welding codes and standards into its jurisdiction, the industry will find itself regimented instead of regulated. Even now several more technical groups are waiting to add their own codes to the welding standards pot.

Everything possible must be done to further the use of welding. This is National Welded Products Month, so now is an excellent time to turn this regulation tide — *before the broth turns into a stew!*

WELD LIGHT GAUGE STEEL WITH AIRCO'S NEW AIRCOMATIC CO_2 GUN—THE AH 30-A

Want to do a production job on steel 3/16" or less . . . economically . . . in any position . . . without edge preparation . . . no clean up and practically no spatter? Get the Aircomatic AH 30-A gun. • **Lower in price,** easier to handle, and more versatile than anything in its class, the Aircomatic AH 30-A is a nimble companion to the rugged AH 60-B gun. Its gooseneck nozzle gets it into the hard-to-reach places. Its expendable parts can be replaced with ease. Air-cooled — no plumbing! • **Wire feeder: any Airco type,** including the inexpensive AHF-D shown here. Wire sizes: the popular .035"-.045" diameters. Gases: argon, argon-O_2 mixtures, money-saving CO_2 from the Pure Carbonic Co., and argon-CO_2 mixture. Rating: 300 amps DCRP CO_2 buried arc or 200 amps DCRP spray transfer.

• **Airco produces the industry's most complete line** of manual and automatic gas-shielded arc welding equipment: welding heads . . . holders . . . guns . . . wire . . . wire feeders . . . welding machines . . . gases . . . accessories. To profit most, whatever you weld, make use of Airco experience. Look for your nearest Authorized Airco Distributor in your Classified Telephone Directory under "Welding Equipment & Supplies" or call your local Airco office.

AIRCO

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For more facts Circle No. 181 on Welding Info-Aid Card

New York becomes world's welding capital

APRIL IS National Welded Products Month—and in no other city in the United States will the citizens be more cognizant of this fact than in New York.

An estimated 18,000 welding-associated visitors are expected to gather in the U. S.'s largest city this month for the American Welding Society's 42nd Annual National Meeting and Ninth Annual Welding Show.

The presence of approximately 300 foreign welding authorities, who will attend both the AWS affair and the 14th Annual Assembly of the International Institute of Welding, will lend a United Nations flavor to the proceedings.

The AWS convention's technical sessions will be held in the Commodore Hotel, April 17 to 21, while the welding exposition will run concurrently at the Coliseum from April 18 to 20.

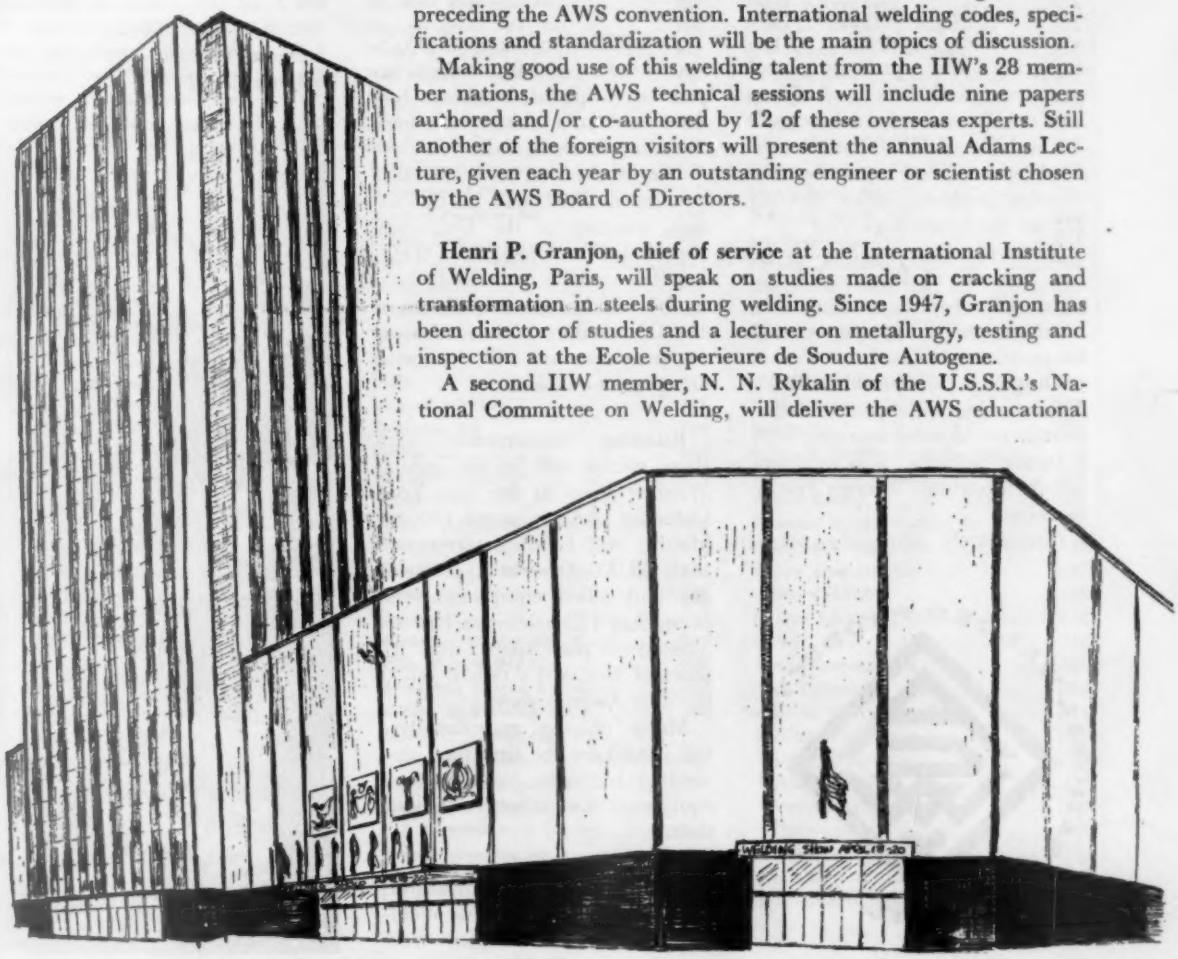
The IIW, meeting in the United States for the first time, will center its activities at the Sheraton-Atlantic Hotel during the week preceding the AWS convention. International welding codes, specifications and standardization will be the main topics of discussion.

Making good use of this welding talent from the IIW's 28 member nations, the AWS technical sessions will include nine papers authored and/or co-authored by 12 of these overseas experts. Still another of the foreign visitors will present the annual Adams Lecture, given each year by an outstanding engineer or scientist chosen by the AWS Board of Directors.

Henri P. Granjon, chief of service at the International Institute of Welding, Paris, will speak on studies made on cracking and transformation in steels during welding. Since 1947, Granjon has been director of studies and a lecturer on metallurgy, testing and inspection at the Ecole Superieure de Soudure Autogene.

A second IIW member, N. N. Rykalin of the U.S.S.R.'s National Committee on Welding, will deliver the AWS educational

NEW York City's Coliseum



WELDING SHOW . . .

lectures on Monday and Tuesday, April 17 and 18, from 4:30 to 6:00 p.m. The noted Russian welding authority's subject for the two-part lecture will be "Heat sources, heat flow and heat effects in welding."

Leading off the regular AWS technical sessions will be Dr. C. G. Keel, last year's International Acetylene Association Moorehead Medalist. The director of the Swiss Welding Association will speak on brazing filler metals and fluxes. (*For news of this year's IAA convention and medalist, see page* 8.)

Some of the subjects among the other 65 papers to be presented at the 22 technical sessions will deal with argon brazing of difficult-to-braze metals; eutectic brazing of Zircoly-2 to 304 stainless steel; advances in electron-beam welding techniques; ultrasonic welding, engineering, manufacturing and quality control problems; and flux and filler-wire developments for submerged-arc welding of HY-80 steel.

(*For a detailed report on fabrication problems when welding HY-80 steel, see page* 75.)

As in recent years, the American Institute of Electrical Engineers will co-sponsor three technical sessions. Three papers will be presented at each.

Outgoing AWS president R. D. Thomas, Jr., will open the convention on Monday morning with a formal address. The meetings will then continue through Friday morning.

Immediately after the president's address, and prior to the Adams Lecture, the AWS national awards will be presented.

Heading the list of candidates for national offices is A. F. Chouinard, National Cylinder Gas Div., Chemetron Corp., as presidential nominee.

Other candidates (who are assured of election if voting follows its normal course) are: for vice presidents, Jay Bland (General Electric, Knolls Atomic Power Laboratory), J. H. Blankenbuehler (Hobart Bros.) and C. E. Jackson (Linde Co.); for directors-at-large, A. N. Kugler (Air Reduction Sales Co.), E. C. Miller (Oak Ridge National Laboratory), J. E. Dato (Linde Co.) and T. E. Jones (Precision Welder & Machine Co.).

Nominees for directors of Districts 2, 5, 8 and 11 respectively are: C. L. Kreidler, P. J. Rieppel, George O. Bland and W. J. Erichsen.

In addition to the usual AWS-sponsored social and technical activities, a special luncheon (*see box*) and an evening conference are also on the agenda.

The conference, on Wednesday evening at 8:00, will be the annual meeting of the University Research Committee of the Welding Research Council. To be held in the Windsor Terrace Room of the Commodore Hotel, the two-paper symposium will deal with arc physics research.

Running concurrently with these events will be the annual Welding Show at the New York Coliseum. An estimated 130 exhibitors will be displaying more than $3,000,000 worth of welding and allied equipment. (At press time 122 exhibitors had requested display space, just 10 short of last year's record set at the Los Angeles show.)

Many of the manufacturers will unveil for the first time new welding methods, products and equipment for industry. Among them:

¶ A boom-type manipulator, manufactured by Pandjiris Weldment Co., offers complete free-

WE schedules special awards luncheon

A special luncheon, sponsored by WELDING ENGINEER as part of its 45th anniversary year celebration, will honor several welding equipment manufacturers for their outstanding contributions to welding. The award luncheon is scheduled for noon, Monday, April 17, at the Park Lane Hotel.

General C. A. Willoughby, Chief of Intelligence under General Douglas MacArthur from 1941 to 1951, will speak on the growing Communist menace.

SITE of the American Welding Society's 42nd Annual National Meeting—the Commodore Hotel.

dom at the welding end of the boom for work rotation and operator control.

¶ A method for one-pass automatic welding in the vertical position, to be shown by Arcos Corp., is an electrogas process using a special flux-cored wire and CO_2 shielding.

¶ A weld viewer for those applications where the weldor must have complete weld visibility but requires frequent hood removal. Manufactured by Airline Welding and Engineering, the shield is mounted on a flexible stand and fits all jigs fixtures, etc.

¶ A spray hardfacing and metallizing unit from Wall Colmonoy Corp., as well as two new experimental hardfacing alloys and several brazing alloys in a unique powder mixture in a high viscosity vehicle.

¶ A plug-in resistance heater, manufactured by J. B. Nottingham & Co., Inc., is used in a building-block system for controlled pre- and post-heat treatment and stress relieving.

¶ An automatic resistance welding control designed for pressure, weld time in cycles and heat percentages, developed by the Weltronic Co.

¶ A metal cutter from Lennox Tool and Machine Builders, which will cut in a center of ¼-in. mild steel plate without a starting hole, at cutting speeds up to 36 ipm.

¶ A semiautomatic production welder manufactured by The Lincoln Electric Co. for its flux-cored vapor-shielded welding process.

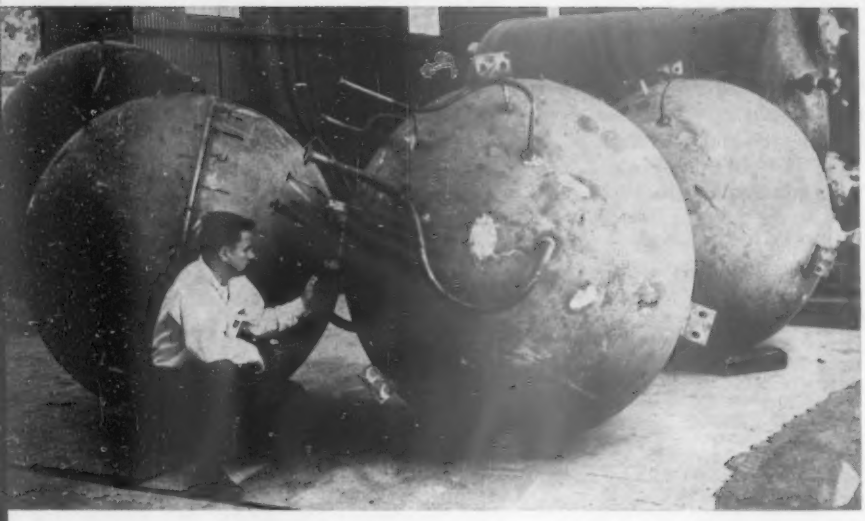
¶ A low-cost process for producing J-grooves in a single pass five times faster than mechanical planers; an oxy-natural gas cutting torch and a portable, hand-guided cutter, all developed by Linde Co.

For more new products, see page 22, *et seq.*

List of Exhibitors

Airline Welding & Engineering	706
Air Reduction Sales Co.	320 & 321
Alloy Rods Co.	601
All State Welding Alloys Co., Inc.	529
Alphil Spot Welder Mfg. Corp.	717
Aluminum Co. of America	631
American Brazing Alloys Corp.	630
American Machine & Foundry Co.	209
American Pullmax Co., Inc.	200
Ampco Metal Inc.	103
Arcair Co.	727
Arcos Corp.	521
Aronson Machine Co.	700
Aro Spot Welder Corp.	612
Balteau Electric Corp.	531
Bay State Abrasive Products Co.	501
Beeco Mfg. Co.	721
Bernard Welding Equipment Co.	220
Branson Instruments, Inc.	130
Bren Weld Corp.	400
Brunmar Commercial Corp.	110
Cam-Lok Div., Empire Products, Inc.	221
Coast Metals Inc.	202
Contour Sales Corp.	227
Cosa Corp.	300
Coyne Cylinder Co.	228
Dockson Corp.	703
Earth Equipment Corp.	707
Emerson Electric Mfg. Co. Inc.	713
Engelhard Industries, Inc.	712
Eutectic Welding Alloys Corp.	134
Exomet, Inc.	124
Falstrom Co.	711
Fenway Machine Co.	131
Fibre-Metal Products Co.	616
Flood Safety Products Co.	109
Frommelt Industries	117A
General Electric Co. Electronic Components Dept.	404
General Dynamics Corp. Liquid Carbonic Div.	304
Glendale Optical Co., Inc.	507
Gregory Industries, Inc.	237
Hamilton Electrona, Inc.	231
Hancock Gross Mfg., Inc.	229
Handy & Harman	312
Harnischfeger Corp.	617
Harris Calorific Co.	634
Harper Trucks, Inc.	629
Hobart Bros.	619
Independent Engineering Co., Inc.	602
International Nickel Co., Inc.	217
Jackson Products Div.	332
Kaiser Corp.	705
KSM Products, Inc.	433
Lenco, Inc.	113
Lennox Tool & Machine Builders	128
Lincoln Electric Co.	520
Linde Co.	421
McKay Co.	222
Magnaflux Corp.	715
Marindus Co.	709
Markal Co.	625
Marquette Mfg. Co.	714
Martin Wells, Inc.	117
Messer Cutting Machines, Inc.	504
Metal & Thermit Corp.	619
Metallizing Co. of America	126
Metals for Industry, Inc.	106
Metco, Inc.	536
Mid-States Welder Mfg. Co.	233
Miller Electric Mfg. Co.	509
Milwaukee Electric Tool Corp.	201
Modern Engineering Co.	600
National Cylinder Gas Div. Chemetron Corp.	436, 437 & 439
National Electronics, Inc.	119
National Torch Tip Co.	336
J. B. Nottingham & Co., Inc.	221A
Omark Industries, Inc.	301
Page Steel & Wire Div.	402
Pandjiris Weldment Co.	420
Philips Electronics, Inc.	213
Phillips Drill Co.	129
Picker X-Ray Corp.	216
Precision Welder & Flexopress	726
J. M. Ragle Industries, Inc.	230
Ransome Co.	305
Reid Avery Co.	525
Rexarc, Inc.	401
Robotron Corp.	212
Robvon Backing Ring Co.	232
Sciaky Bros., Inc.	729
Secheron Works Co.	203
Sellstrom Mfg. Co.	638
Simonds Abrasive Co.	208
Singer Glove Mfg. Co.	101
A. O. Smith Corp.	532
Sperry Products Co.	718
Square D Co.	505
Steffan Mfg. Corp.	100
C. H. Stevens & Co., Inc.	223
Steody Co.	424
Sylvania Electric Products, Inc.	114
Tec Torch Co., Inc.	316
Tempil Corp.	528
Thomson Electric Welder Co.	732
Toyomenka, Inc.	537
Tweco Products, Inc.	627
Uniflex Cable Div.	108
Unique Equipment Co.	514
Vickers Inc.	728
Victor Equipment Co.	604
Wall Colmonoy Corp.	236
Welding Alloys Mfg. Co.	111
WELDING ENGINEER	719
Weld Tooling Corp.	739
Welduction Corp.	104
Welsh Mfg. Co.	533
Weltronic Co.	609
Wespo Div.	132
Westinghouse Electric Corp.	333
Wheelabrator Corp.	613

a special report



LIQUID oxygen storage vessels are actually two vessels in one. Outer carbon steel shell covers 9% nickel steel inner shell. Compound-insulated vessel will hold gases at —320 F at pressures up to 400 psi.

Tests prove 9% nickel steel meets requirements for cryogenic service

IN THE LAST FIVE years, the cryogenic market has doubled — and in the next five it is expected to double again.

Modern industry has always made use of a certain amount of cryogenic liquids. But with the advent of the missile age and its emphasis on "compactness" in all phases from electronic systems to fuels, the demand has intensified.

This compactness is obviously an advantage to all other industries using gases. As liquids, gases such as oxygen, hydrogen and nitrogen occupy much less space (*e.g.*, liquid oxygen has 862 times less volume than gaseous oxygen; liquid nitrogen, 696 times).

The main problem in cryogenics is to maintain the gases at temperatures ranging from —100 to —452 F. The solution lies in the proper selection and fabrication of materials for low-temperature equipment.

That's the market. The chief competitors vying for an increased share of it: 9% nickel steel and 5083 aluminum (stainless steel dominates).

Both metals have good weldability and ductility, prime requirements if they are to be used in low-temperature service.

Nine percent nickel steel is a low-carbon, high-nickel steel plate material primarily intended for pressure vessel use at low temperatures. When quenched and tempered or double normalized and tempered, it possesses good notch toughness characteristics down to —320 F.

In its February issue, WELDING ENGINEER described the battle line being drawn by metal producers to get their share of the growing market for containers to store and ship liquid oxygen and other liquefied gases.

As promised then, welding data on two of the major metals vying for this market will be presented, beginning with this article on 9% nickel steel. Specifications for welding 5083 aluminum will be detailed in our next issue.

Some of the first vessels fabricated with this A-353 steel were welded with 25-20 stainless steel electrodes. Weld joint strength, however, was somewhat below the minimum specified tensile strength.

Thus, the designer could not make full use of the steel's strength. In all other respects, the 25-20 stainless joint was satisfactory.

The most recent fabrication with 9% nickel steel has been done with a high-nickel, chromium-iron electrode (Inco Weld A). This electrode's composition is capable of producing joints with strengths higher than the minimum specified for the A-353 steel.

Test welds were made on two different thicknesses (5/16 and 1 in.) of 9% nickel plate by Lukens Steel Co., Coatesville, Pa., largest commercial producer of the alloy.

Chemistry and physical properties of the test plates as compared to ASTM specification for A-353 are shown in table 1.

On the 5/16-in. test plate, edge preparation involved grinding or machining the surfaces to obtain a 1/16-in.-thick flat nose (land) with a 35-deg bevel above it. The plates were then positioned with a 1/16-in. root opening.

Chemical, physical properties

Chemical elements	Test plates, percent	Specification A-353, percent
Carbon	0.09	0.13 max.
Manganese	0.47	0.80 max.
Phosphorus	0.011	0.035 max.
Sulfur	0.021	0.040 max.
Silicon	0.21	0.15-0.30
Nickel	8.93	8.50-9.50

Physical properties	Test plate*	Specification A-353
Tensile strength	118,000 psi	90,000 min.
Yield strength**	84,500 psi	60,000
Elongation	28% in 8 in.	22% min. in 2 in.

* 1 in. test specimens
** 0.2% offset

TABLE 1 — Chemical and physical properties of 9% nickel test plate compared to ASTM specification for A-353 steel.

The first three passes were made with Inco Weld A electrodes, 5/32 in. in diameter, using a welding current of 120 amp. The three passes filled the bevel which has an included angle of 70 deg.

On the back side, a groove 3/8-in. wide by 5/32-in. deep was ground out. Two passes were required to complete the weld. The first was made with a 1/8-in.-diameter electrode using 90 amp current, while the cover pass was made with a 5/32-in.-diameter electrode at 120 amp.

Tensile and bend tests were then conducted in accordance with requirements of the ASME code. Test results were:

Tensile strength	108,200 psi
Yield strength	72,800 psi
Elongation in 2 in.	10%
Reduction of area	36.7%

The 180-deg bends made on face, root and side demonstrated good weld results.

On the 1-in.-thick test plate, a vee-joint was machined with a 35-deg bevel on each plate edge, including a 3/16-in. land. Root opening was 3/32 in.

All passes were made with 5/32-in.-diameter Inco Weld A electrodes at 120 amp. To fill the joint, 15 passes were required.

Finally, the root pass was back-ground to ½-in. depth and ¾-in. width in a U-shape and nine additional passes deposited to complete the joint.

Test results, using an 0.505-in.-diameter tensile test across the weld, were:

Tensile strength	106,500 psi
Yield strength	76,400 psi
Elongation in 2 in.	14%
Reduction of area	40%

The 180-deg ¾-in. radius bends made on face, root and side indicated average elongation of 35%, 38% and 31%, respectively.

Specific shop practices and procedures sometimes require deviation from weld bevels used in laboratory testing. According to numerous fabricators, the various edge preparations for the joint provided results similar to those in the tests, within the normal range of good welding practice.

A basic requirement in welding 9% nickel steel is extreme cleanliness. Before fabrication, components should be pickled or sand-blasted.

Immediately prior to fitting the components together to close or restrict access to inner surfaces of a vessel, these surfaces should be cleaned again to ensure removal of all dirt and oil. A muriatic acid wash, followed by a water rinse, is suggested.

For stress relieving after welding, a furnace with a neutral or reducing atmosphere is recommended. Normally, a detrimental scale should not appear under these stress relief conditions.

However, as a final precaution, another muriatic acid wash and water rinse after stress relief will remove any remaining scale and loose particles.

Stress relief was conducted in accordance with ASTM and ASME code specifications. Recent demonstrations, however, have shown that quenched and tempered, or double normalized and tempered, 9% nickel steel can meet and exceed these specifications in the as-welded condition. (WE, Dec. 1960, p. 38.)

(*For a reprint of this article, circle number* 248 *on the Welding Info-Aid Card, page* 123.)

POINTED insulation pins are percussive welded to ductwork in this application without burnthrough.

BLANKET insulation is then applied (above) to pins in a simple operation. Insulation is secured permanently (below) with push-on clips.

by **Charles A. Gunn**
Omark Industries, Inc.
Portland, Oregon

✓ **Fast**

✓ **Strong**

✓ **Economical**

Thin-metals percussive welded without marring or distortion

FROM POLARIS MISSILES and electronic circuits to frying pans and coffee pots, thin-metal products are being manufactured free from marring and distortion — thanks to percussive welding.

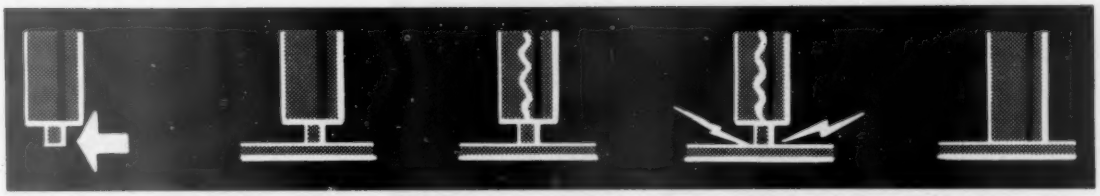
This stud welding system, developed by Graham Mfg. Corp. (since acquired by Omark Industries, Inc.) makes use of an electrical stored energy (capacitor) welding method. It is neither resistance nor fusion welding, as these terms are conventionally understood, but combines features of both.

Fusion is produced simultaneously over the entire area of abutting surfaces of the stud and work piece. This is done by heat obtained from the arc produced by a rapid discharge of electrical energy.

The forge welding force is applied during or immediately following the electrical discharge.

In ordinary stud welding, the stud contains a flux-filled tip and requires a porcelain ferrule to protect and shield the arc.

In percussive welding, however, no flux or special materials are required. And the only preparation necessary is the small tip at the end of the stud to be welded.



When this tip, which is part of the stud . . .

Contacts the metal, which may be thinner . . .

Current flows, causing the air to ionize . . .

An arc results, which melts the stud diameter . . .

Forming a weld, without fillet or marks . . .

This tip is an integral part of the stud and protrudes from the center of the stud end. It is designed primarily for arc initiation.

Tip sizes range from 1/64 to 1/32 in. in diameter, and from 1/64 to 3/64 in. in length. In any case, the tip must have at least four times the electrical resistance as that of the stud shank.

The welding force is supplied by pneumatic cylinders on each type of production (bench) welder and spring-loaded, portable welding gun.

The welding procedure is as follows:

1 — The tipped end of the stud is spaced at a predetermined distance from the surface of the material to which it is to be welded.

2 — The welding power supply is electrically connected to the stud and the work piece so that a potential difference exists between the two.

3 — The stud is moved toward the work piece until the tip makes contact. This releases the stored electrical energy and causes the high resistance tip (because of its small size) to disintegrate.

(*The air between the stud and the work piece is thus ionized, which results in an electrical arc. The arc, in turn, causes superficial melting of the adjacent surfaces of the stud and work piece*).

4 — These melted surfaces are then forced together so as to fuse and weld the two parts.

When the arc is initiated, the instantaneous current flow is very great. However, the time period for the flow is very short, being about 0.001 to 0.005 seconds (one to five milliseconds) for completing the capacitor discharge cycle.

Total welding heat input, therefore, is small. (Arc penetration into the base metal is only about 0.005 to 0.010 in.)

Thus, this low, concentrated energy input enables the welding of metal trim, as well as vinyl-coated parts, without distortion, discoloration or marking on the work piece's "show" side.

The electrical welding input current is supplied by four 22,000 MFD capacitors connected in parallel by means of copper bars. The negative bar is fitted with a disconnect link so that welding is permitted with either two or four capacitor banks.

A 200 ohm series resistor is connected to the capacitors so that the initial current inrush is limited to a safe amount.

The capacitors are charged by a d-c output motor generator. The charging operation takes approximately 0.8 seconds and is controlled by a charging contactor. In this way, then, the capacitors are electrically isolated from the motor generator just before and during the welding period, and are recharged between welds.

The amount of charging voltage that the motor generator produces is controlled by a 1,250 ohm, 150 watt rheostat and can vary from 30 to 150 volts. The motor generator operates on 440 volts, 60 cycles, three phase power.

Ten advantages of percussive welding

1 — The process is fast and economical.

2 — Welds are of moderate strength.

3 — Appearance of welds is excellent.

4 — Low cost per weld and high productivity.

5 — Tooling is simplified; low in cost on portable and production type machines.

6 — Aluminum can be welded up to ⅝-in.-diameter without any shielding and/or fluxing process required.

7 — Aluminum can be welded to die cast parts, eliminating boss projections.

8 — Close tolerances can be maintained to ± 0.005 on production equipment.

9 — Ferrous and non-ferrous metals can be percussive welded (aluminum to aluminum, steel to steel, steel to lead-free brass, steel to stainless or plated steel, aluminum to die cast zinc, and copper to steel).

10 — Portable, production and custom-built welders available for all types of industries.

by **Nicholas S. Hodska**
Design Engineer
Sikorsky Aircraft Corp.
Stratford, Conn.

How to evaluate shrink and draw strains

SHRINK AND DRAW STRAIN variations in weldments continue to be a serious and frequent source of trouble, even though heating problems are being alleviated through modernization of welding systems.

However, by understanding the behavior of various metals (grain growth, recrystallization, heat reactions), design and welding techniques can be developed to overcome these problems.

Progress is made as more is learned about the characteristics of each type of metal, *e.g.*, permanence of grain structure assures better welds and less shrinkage; use of light metals assures creep-free metals under sustained loads.

But beside studying the types of metal to be used, the designer must also consider the welding method, weld position and type of electrode to be used. More important, he must visualize the designed part as it will be assembled, to assure successful fabrication.

Shrinkage problems are a result of several factors: the parts to be joined, the metal used, type of electrodes and heat application (which is often determined by the job on hand).

To minimize shrink and draw strains, the designer must know the welded assembly's final use, as well as such operating parameters as temperature range, stresses, etc.

In planning for production welding, filler metal placement, type of controlled atmosphere and exact temperatures during welding are usually best left to the welding supervisor.

On the other hand, design of parts to be welded, plans for jigging during welding, joint tolerances, mismatch and warpage must be determined well in advance of any welding on a production basis.

The designer must also avoid undue metal thicknesses, especially abrupt joining of thick and thin sections, which could cause defective parts because of shrink and draw strains. Often only a slight design modification is required.

When a metal is heated, it expands. When cooled, it contracts in several directions (the greatest being across the weld) — if it is free to do so. In fusion welding, however, it is not free to shrink or draw because it is joined to the parent metal at a lower temperature.

Thus, the parent metal contracts less while the metal shrinking and

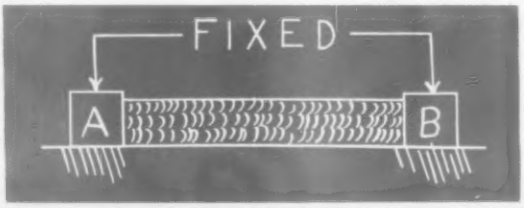


FIG. 1 — Maximum shrink and draw strains are produced when parts A and B are fixed and cannot move toward each other as they cool after welding.

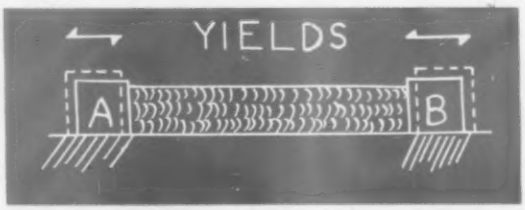


FIG. 2 — Component parts A and B are designed to yield, normally, within safe limits after cooling.

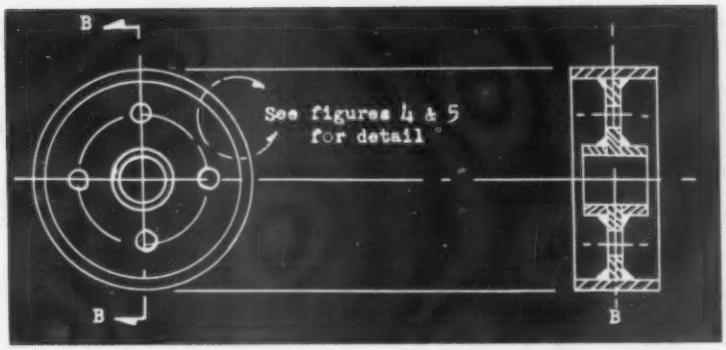


FIG. 3 — Large disc-wheel design allows weld to contract and draw free surfaces closer together without danger of cracking or warping.

drawing the most will be in tension.

Shrink and draw strains are greatest when parts cannot move toward each other as they cool. To keep these strains within safe limits, the parts can be designed to yield to shrinkage without producing serious stresses and strains. (See figures 1 and 2.)

When welding cylindrical parts with an integral shaft and the center line parallel to the radial axis, any surface imperfection, out-of-roundness, warpage or distortion will affect the parts.

Variation in bearing diameters, after welding and cooling, is often so great that the piece is out of shape. Contraction stresses, which occur very quickly because of tension, can adversely effect concentricity of bearing diameters.

Dissimilarity between two bearing surfaces of a shaft due to shrink and draw strains will cause misalignment and also influence effective concentricity. In addition, shaft ends spread out and must be aligned again between centers prior to further welding.

Generally in a welded disc-wheel arrangement (figure 3), errors arising from warpage conditions can be minimized in most cases by controlling and working with the components of misalignment in the pitch and axial planes (figures 4 and 5).

The component in the pitch plane will affect three directions and cause shrinkage and warpage. Any one of these factors may be the limiting condition. Thus,

$$\alpha_1 = \frac{\Delta p}{T}$$

where α_1 equals allowable misalignment from shrinkage, in the pitch plane of a part, inches/inch;
Δp equals apparent change in part thickness, inches;
T equals thickness or width of part, inches.

In a welded part, the value Δp should be small compared to the tolerances for the part. Also, α_1 should be small compared to the length misalignment. In practice, however, warpage and shrinkage tolerances may be exactly stated to take care of any undue contraction or warpage.

The component in the axial plane will affect the center distance setting. Again, any one of several factors may be the limiting condition, that is:

$$\alpha_2 = \frac{\frac{\Delta a}{T}}{L} = \frac{\Delta c}{L}$$

where α_2 equals allowable misalignment from shrinkage in the axial plane, inches/inch;
Δc equals allowable center distance error;
L equals effective length of welded parts, inches.

Welding skill is more than just ability to direct proper weld metal where needed. Experience and skill are required to weld long beads or seams without distortion or contraction problems.

A long bead should never be

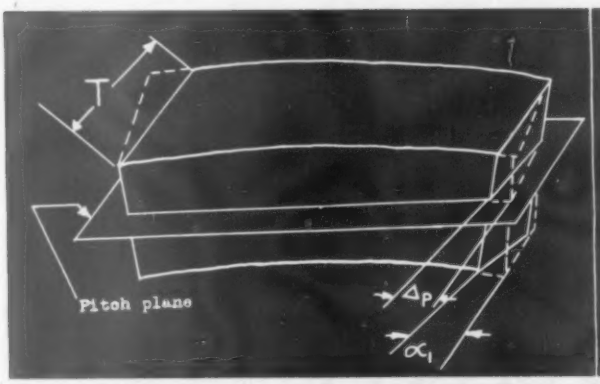


FIG. 4 — Welded and cooled section of disc-wheel. Shrink and draw misalignment in pitch plane should be maintained to a minimum and to tolerances for effective weld thickness, mismatch and warpage errors.

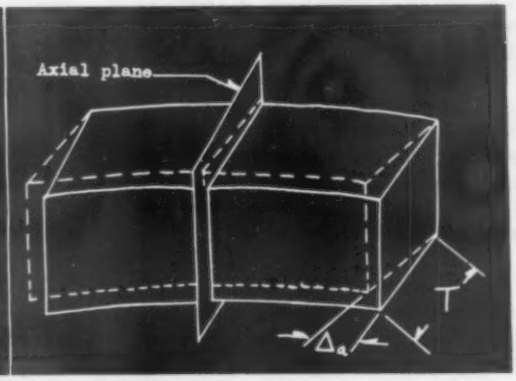


FIG. 5 — Out-of-roundness is affected by axial component of disc-wheel misalignment. Maximum allowable value for this component is limited by the smallest number of factors. Drawings are detail of figure 3.

Seven ways to minimize strains

- Make certain the end parts meet or exceed technical and performance requirements and all applicable quality and weld reliability specifications are maintained.
- Specify stress relief when heavy welded parts are to be machined to a high degree of accuracy and are to be subjected to a high stress, as well as where sum of contraction and working stresses might cause failure.
- Through proper welding engineering and production control, welding operations should be simple, direct and easily applied, resulting in shrinkage control within safe limits.
- Welding and engineering personnel should be familiar with proposed designs, the performance characteristics and the proposed welding method. Time required to cool the part or structure should be estimated for shrinkage percentage.
- Establish a simple program/project, if necessary, to study and correct defective parts due to shrink and draw strains.
- Assurance of top welding production equipment, personnel and facilities to make the proper welds will greatly assist in controlling strain problems.
- Make certain the quality and type of weld, heat range, and cooling are rigidly maintained at a minimum of cost.

welded from one end to another in the same direction. Unequal expansion and contraction will result in distortion and severe shrink and draw strains.

The joint should be tack-welded first and completed in sections, starting in the center. A section on one side some distance away should then be welded, followed by a similar one on the other side.

If plates of different thicknesses are joined, minimum size of the weld will correspond to the thinnest plate. It has been noted that the minimum length of a fillet weld should be three times its size, that is, three times the leg.

Furthermore, a small weld joining heavy steel sections is likely to crack or shear from contraction stresses, whereas a heavier weld may have enough strength to distort the parent metal slightly, and thus avoid a strain or crack.

Minimum fillet weld size for a design to be used with a given plate thickness is shown in figure 6.

For example, if a 3/8-in. plate 72-in. long is to be welded to a ¾-in. plate and is to support a load of 150,000 lb. in shear, the safe stress is 10,000 psi with maximum spacing of 6½ in. The problem is to find the length of weld required.

Referring to figure 6, enter the ⅜-in. plate value at the bottom of the chart and proceed upward to the curve, reading the weld size as ¼ in. (left side) and its throat size as 0.177 in. (right side).

To find the weld area, locate 150,000 at point 1 on the data sheet nomograph and connect this value with 10,000 at point 2 (using scales 1 and 3) and reading the weld area as 15 sq in. at point 3.

Then, connecting values for the weld area and throat at points 4 and 5 (scales 4 and 5), the required weld length at point 6 is 85 in. or 42½ in. on each side.

Hence, you would use seven welds, each 6½-in. long and spaced 6½ in. apart. To avoid fractional dimensions, however, use nine welds, each 5 in. long and spaced 5 in. apart.

The safe value of stress and draw strains is determined by accelerated laboratory weldment tests and field experiments. The effects are evaluated by instruments and by visual observation, measurement of loss or gain in strength, and changes in physical dimensions.

The true value of safe stresses would be determined best by actual field tests closely approximating load conditions to which the welded system would be subjected in service. Test stations should be set up at several locations in the U. S. to study and analyze the effects of severe natural and outdoor industrial conditions.

The results would then be gathered into a comprehensive record of shrink and draw strain data.

(For a reprint of this article, circle number 249 on the Welding Info-Aid Card, page 123.)

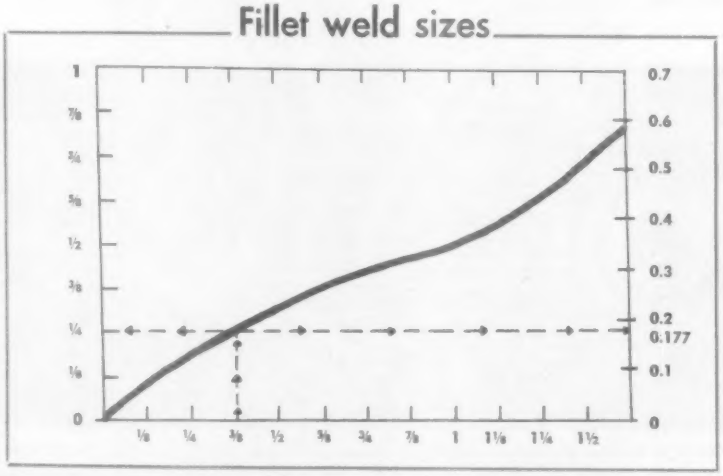
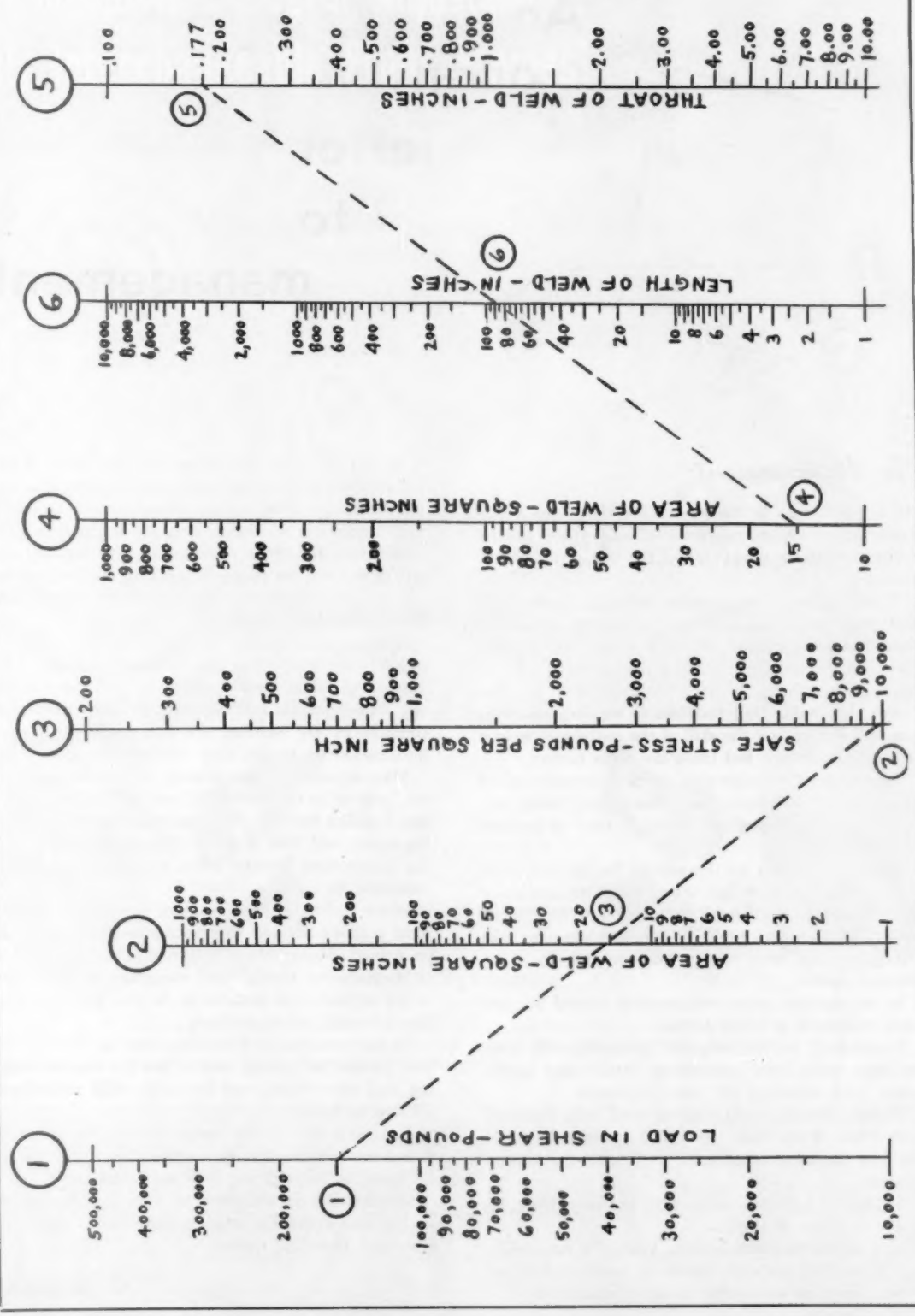


FIG. 6 — Minimum fillet weld sizes for different plate thicknesses. Left: size of weld; right: throat of weld.

Determining weld area, length



A weldor gives his candid views on the obligations of supervisors in . . .

An open letter to management

To Management:

As a long-time weldor, I think there are a few areas in which management should show greater concern — areas which affect the net profit of the industry.

Trade journals, engineering schools, quality control people, and management constantly remind us that "the weldor must create a sound and reliable weld." As weldors, we feel this obligation as a burning, personal thing.

We also realize that variables in welding processes are well known and the skill of the individual weldor is a definite factor. But there are other factors.

Speaking for management, a writer recently called attention to the excellent equipment now being produced and the high-grade materials used in modern electrodes.

Since final results are determined by the individual weldor, the same writer stated that the company should concern itself with the daily activities of its men. The inference, I take it, is to weldors who pass test plates and later turn out a poor job for some personal reason.

In my opinion, poor workmanship caused by personal reasons is a minor factor.

Remember, we are required to weld with your machine, using your procedures, under your supervision, and inspected by your inspectors.

If management would concern itself with variables over which it has some control, I am sure it would not feel the need to concern itself with the human element.

In short, I believe management in the welding industry is guilty of apathy.

At a recent technical session, I heard a nationally-known welding authority relate an incident that occurred when he was called in on a problem.

He set up a test procedure and was directed to a welding machine in the work area. The machine was unsatisfactory. After trying several machines, he had to settle for one which had been serviced last in 1958.

Weldors are often required to use welding machines that are not properly serviced, and believe me, not all weld shops have those newly-developed electrodes available to them.

Management is also remiss in another area. It neglects to insure that the welding engineers keep abreast of latest developments in welding technology. Many people sent by management to technical conferences on welding are not qualified to pass information on to the shop weldor.

Management can spend many dollars sending representatives to these sessions, and still fail to receive any benefits because the representative often writes his report and files it away. The weldor never gets the information because these representatives fail to recognize its value.

More and more shop weldors are attending technical sessions because they recognize the benefits to be gained. Management should encourage this.

Management should also recognize its obligation to set up technical sessions in its own plant for further education of its weldors.

As someone has said, welding is a highly satisfactory method of joining metals, but inadequate training and supervision, and incorrect weld procedures all lead to failure.

And since such failure harms the welding industry, it is inconceivable that management can continue to be apathetic toward any welding problem.

Management is obligated to shed this feeling of apathy and recognize welding for what it is — an advanced technical science.

A Weldor

For more facts Circle No. 182 on Welding Info-Aid Card →

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2. Three-position stop for lowering helmet.
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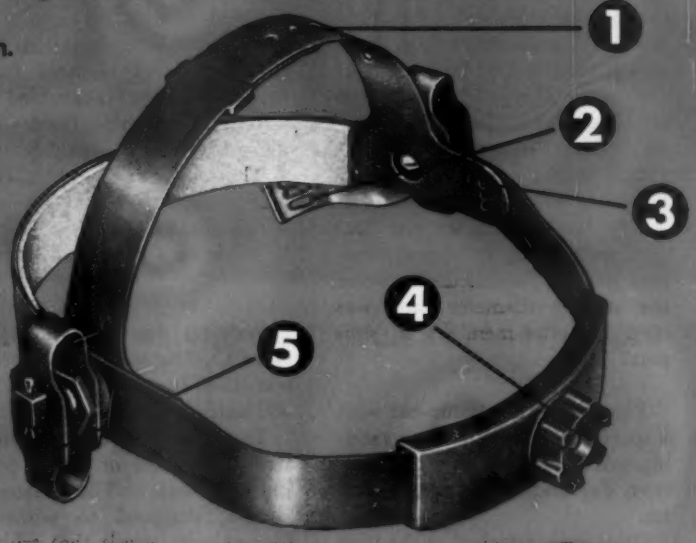

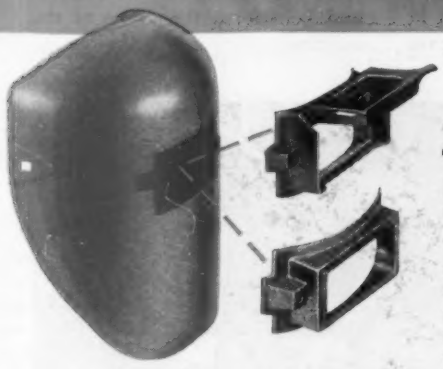

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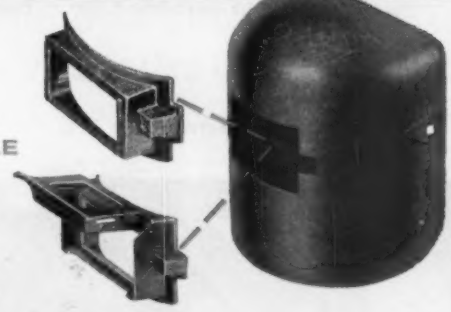

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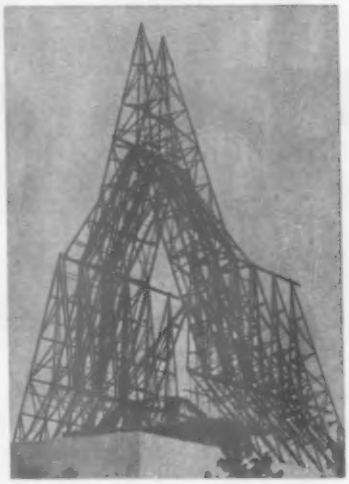
Steel pipe forms chapel spires



WELDED 75-ft-long tetrahedrons form the first two of 17 spires of the Air Force Academy chapel.

ONE HUNDRED TETRAHEDRAL-SHAPED steel pipe supports have been CO_2-Mig welded to form the multi-spired chapel at the U.S. Air Force Academy, Colorado Springs, Colo.

The 75-ft-long tetrahedrons were fabricated in St. Louis by Mississippi Valley Structural Steel Co. and shipped by train to the chapel site. Pipe used for the project was 4-in.-diameter (0.237-in.-thick) and 6-in.-diameter (0.432-in. and 0.280-in.-thick) made by Republic Steel Corp., Cleveland.

The larger diameter pipe was used for primary structural members of the tetrahedrons while the smaller diameter pipe was used for cross-members in support.

Pipe ends were flame-cut with a special machine and then sand-blasted to remove pipe coatings, burn slag and other foreign matter.

Clips were attached to the pipe members prior to assembly. Clip welding distortion was removed from all chord and web members before pipe assembly.

First one face of the tetrahedron was assembled, tacked and tilted upward by rotating the straight edge about its axis. Then the opposite face was assembled and tacked.

Girt angles for aluminum panel coverings, and channel frames for plaster were assembled and tacked to the pipe frames during pipe frame assembly.

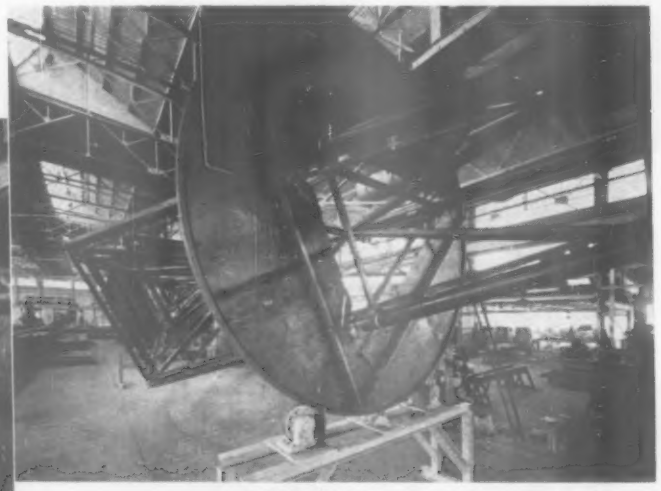
The assembled tetrahedron was then placed into two rings which rotated it so welds could be made in a horizontal position.

Welding was performed with two CO_2-Mig welders. Wire used was 0.045-in. diameter at a 300-380 amp d-c current range.

The completed chapel will resemble a series of spires pointing skyward. The triangular shapes, designed to withstand high-velocity winds that whip in from nearby Rampart Mountain Range, will stand single file with a total of 17 spires exposed to the elements. Each of the spires is designed by joining four tetrahedrons to form an inverted vee-shape. Two tetrahedrons form each leg and the other two form the spire point of each vee.

Remaining tetrahedrons will be inserted between the edges of the spires to complete the design and help form the shape of the building.

CO_2-MIG welding is employed to join steel pipe for tetrahedral-shaped supports of the chapel.



ASSEMBLED tetrahedron is held in one of two rings which rotated it so welds could be made in a horizontal position.

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Mig, Tig help assemble custom-built machines to meet unique production methods.

Welding aids plastics industry

by A. W. Anderson and M. J. Quigley, Jr.*

CUSTOM-BUILT MACHINERY, which modern welding processes are helping to assemble, has been created to meet the unique production methods in the plastics industry.

Basic steps in plastics production include dicing, grinding, storage, extruding and molding. By switching to semiautomatic Mig welding, Cumberland Engineering Co., Inc., Providence, R.I., gained time savings as high as 90 hours per unit in fabricating such machines.

This represents a 22% increase in production rate, compared with previous manual metal-arc welding.

For continuous service, Cumberland makes the heart of each machine — the cutting chamber — a sturdy, all-welded unit. Chamber structural elements are cut to shape from 1½ to 2-in.-steel plate and edges are prepared for fillet welding.

Mig welding machines from Linde Co., New York City, are then used to join the components. Welding speed averages 10 ipm using a 200 amp current at 28 volts.

Cumberland reports no evidence of weld porosity with argon-shielded Mig welding. Improved weld quality has eliminated post-weld cleaning which was necessary with metal-arc welding. This factor, plus the semiautomatic operation, has substantially increased production rates.

Storage of polyethylene resin is somewhat similar to grain storage. The light, granular product must be kept cool and dry, yet must easily be siphoned off in quantity. Large aluminum storage hoppers have been developed to meet these requirements. Air entrainment forces the resin through pipes which fill or empty the hopper.

A. Gunthard Co., Ennis, Tex., recently completed 62 of these 30-ft-high by 9-ft-diameter tanks using Mig and Tig welding. Tank heads are 5/16-in.-thick aluminum while supporting and mounting rings are 1½-in. thick.

Prior to welding, ¼-in.-aluminum plate edges are sheared and approximately ⅛-in. spacing is allowed between butt joints. Vessel components are Tig tack-welded on outside seams using a minimum number of welds. Tack welds are then ground to prepare for Mig seam-welding.

All major seams are welded in a continuous, manual operation. Inside butt welds are completed first; then, outside seams are ground to sound metal and butt-welded. Average welding speed is 15-18 ipm using 3/64-in.-diameter wire and 180 amp current at 22 volts.

Production savings were significant since one weldor using the Linde torch completed all major seam-welds on one vessel, both inside and outside, in approximately 12 hours.

*Mr. Anderson and Mr. Quigley are welding sales engineers with Linde Co. in Dallas and Boston, respectively.

OUTSIDE seam on aluminum storage hopper for polyethylene resin is welded.

WELDOR joins 2-in. plate for cutting chamber of plastics grinding machine.

User-tested NOTTINGHAM Multi-Arc Welding Systems let you...

"Building block" system with rugged, compact, interchangeable units, all engineered specifically for economical multi-arc welding. Proven through more than five years' use in heavy construction and fabrication by industry and government agencies.

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COLUMBIUM — valued up to $300 a pound — is Tig welded into tubing at NTH Products, Inc., El Cajon, Calif.

Reactive metal tubing is Tig welded on a production basis

- ✓ Tantalum
- ✓ Columbium
- ✓ Zirconium
- ✓ Hafnium

THIS 90-ft hydraulic stretch leveler also produces various tube shapes by cold-drawing round tubes through turkshead mounted on one end.

REACTIVE METALS — such as tantalum, columbium, zirconium and hafnium — are now being Tig welded on a production basis.

These exotic metals are being used for tubing for high-speed aircraft, missiles, nuclear reactors and in other high-temperature structural applications where thermal insulation or cooling is impractical or impossible.

NTH Products, Inc., El Cajon, Calif., developed these production techniques for welding the refractory metal tubes. Using a-c/d-c Tig welders made by Birdsell Products, an affiliate of Susquehanna Sciences, Inc., Pasadena, Calif., and their own stationary head welding fixtures, NTH has set up a semi-continuous tube mill operation with interchangeable squeeze rolls and spreader guides. The rolls also provide sufficient metal upset by air pressure.

One welding fixture can handle tubing ranging from 3½-in. to 48-in. diameter. This fixture also makes it possible to weld tapered tubing and edges of flat banks of different thicknesses up to 21-ft lengths. Tubing over 0.025-in. thick is fed into the fixture by a pusher bar; a puller bar is used for thinner material.

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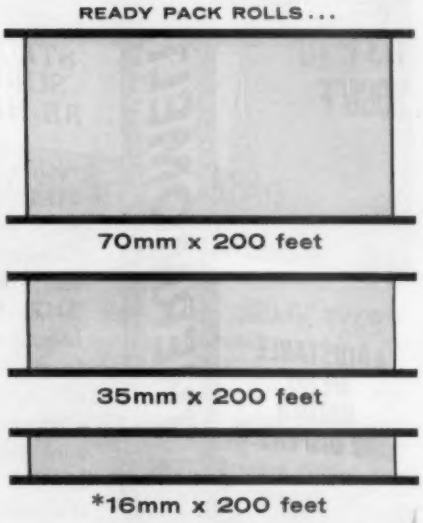
For further information or to order a supply, contact your x-ray dealer or write us for a Kodak Technical Representative to call.



*For the present this size available only on a special order basis.

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cleaned, prior to welding, with abrasive cloths and files.

The main characteristics of these refractory metals include:

1—high melting points.

2—resistance to many acids.

3—high strength plus heat and corrosion resistance.

4—low thermal neutron absorption — except for hafnium. (Hafnium has the unique ability to absorb neutrons, which makes it ideal for control rods in reactors).

In normal fabrication, welds on these reactive metals were made to protrude at least 10% of wall thickness outside the tube wall. It was believed the weld would not heat treat up to parent metal strength. This method also required using a filler rod.

Disproving this theory, NTH developed welding techniques to produce seams, roller forged to the same thickness as parent metal, which, when heat treated, have equal strength with parent metal.

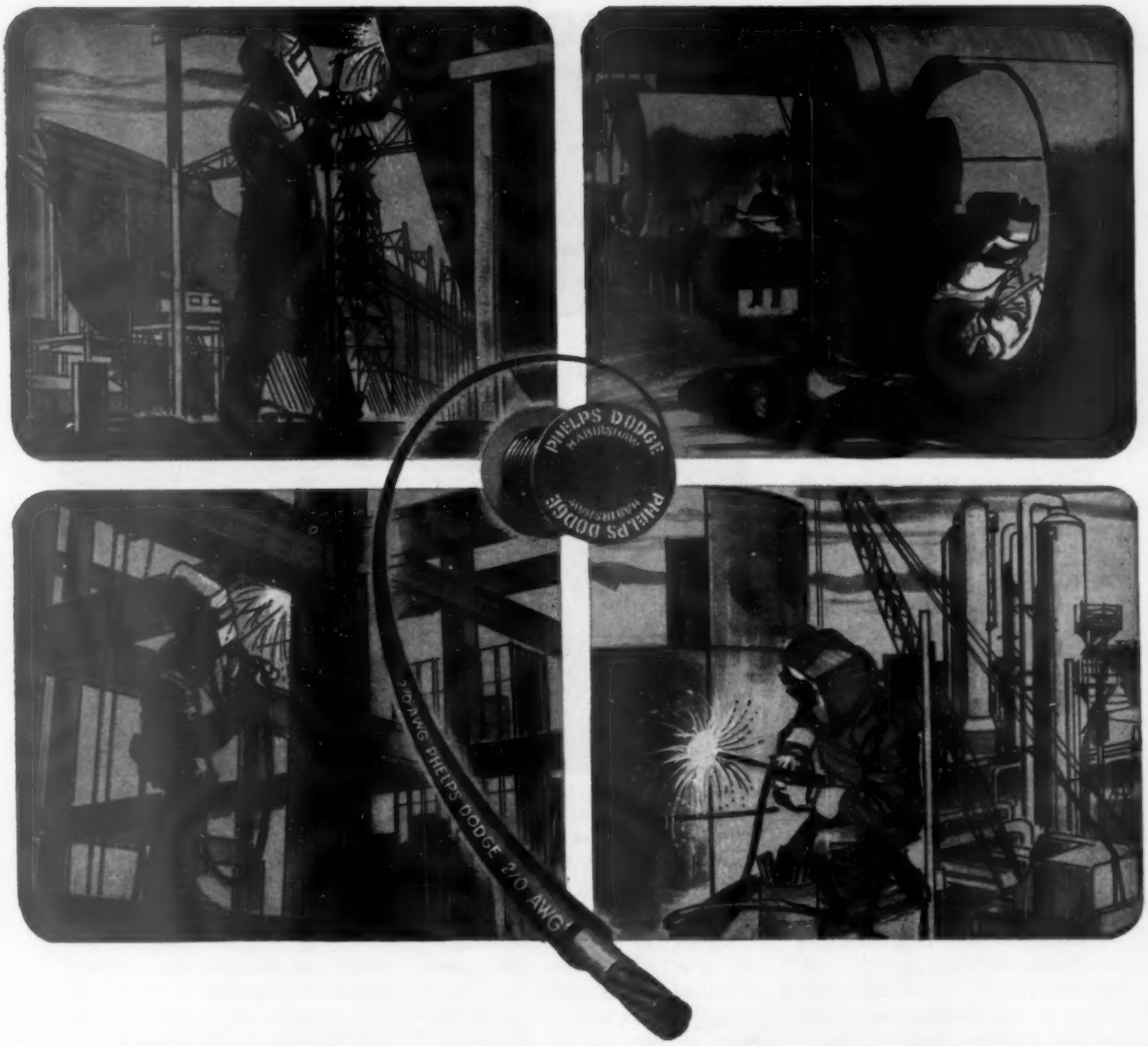
In a typical operation, columbium tubing, alloyed with 1½ zirconium, must pass X-ray, die penetrant and helium leak-detector tests.

Dimensions of the columbium tubing are 3,300-in. ID, 0.060-in. wall thickness and 18-in. length. Current used is 12 volts at 200 amp with a travel speed of 4 ipm. Gases are a mixture of argon and helium with gas flows of 30 cfh and 20 cfh respectively. Due to the high amperage used, a water-cooled trailer bar is required.

Thinwall tubing of the reactive metals, down to 0.005-in. wall thickness, is now being Tig welded in similar operations using 10 volts at 4 amp. The firm plans to weld tubing 0.003-in. thick soon.

To make this specialized tubing, NTH designed most of its machine tools including a 90-ft hydraulic stretch leveler which also sizes and stress relieves.

The machine will also produce various tube shapes by cold-drawing round tubes through a turkshead mounted on one end. Air chucks on cylinder rams clamp the tubing to the cylinders. A mandrel inside the tubes irons the size to hairline accuracy. Tension capacity is 95,000 lb.



Phelps Dodge Habirprene* Arc Welding Cable

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More than 10 years ago, Phelps Dodge pioneered Habirprene welding cable—the first real advance in this field. Today's Habirprene welding cable is the result of Phelps Dodge development and manufacturing experience devoted over the years to providing an arc welding cable of superior quality with a proven record for safety, dependability and long life. This cable meets all requirements of A.S.T.M. D752.

See your authorized Phelps Dodge distributor for hard-wearing, long-lasting Habirprene arc welding cable with indelible gold markings. Phelps Dodge also makes a full line of rubber arc welding cable and welding power supply cable. All these cables are available from stock.

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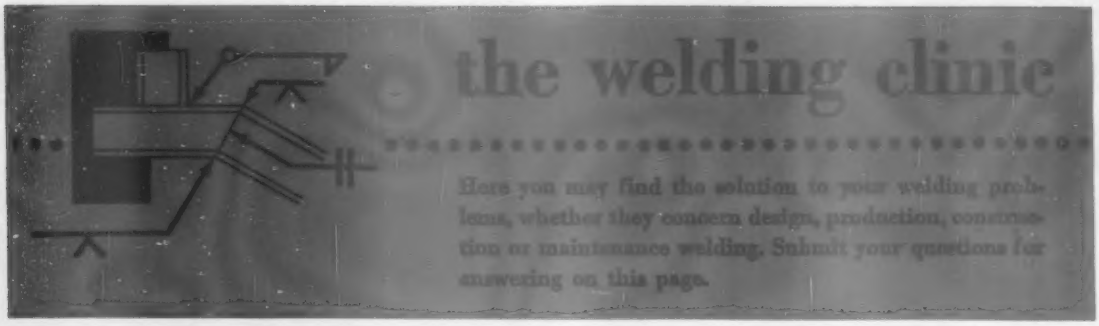

the welding clinic
Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

How to gas weld aluminum

Question:

Can you give me some basic information on procedures for gas welding aluminum?

Answer:

Aluminum gas welding is used only when oxyacetylene equipment is readily available and electric power sources are not.

Butt, lap and fillet welds can be satisfactorily made on aluminum sections from 0.040-in. to 1-in. thick by gas welding, according to the THE WELDING ENCYCLOPEDIA, 14th Edition.

Oxyhydrogen or oxyacetylene flames produce necessary heat to offset high thermal conductivity of aluminum. Generally, other oxy-gases do not provide sufficient welding heat, but may be used for preheating when joining thick sections.

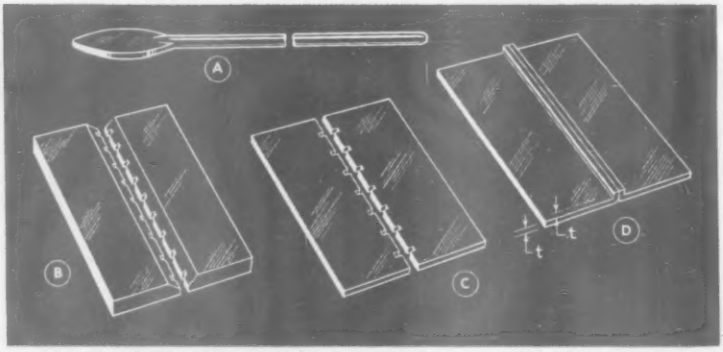
If a bare rod is used to gas weld aluminum, a flux must be applied to the rod before introducing it into the flame.

Metals of high purity are usually welded with commercially pure aluminum. To weld 1100 or 3003 aluminum, 1100 rod is used as filler metal while 4043 rod is commonly used for joining 5050, 5052, and 6061.

Joints should be designed as butt welds wherever possible. If an overlap joint must be made, it should be completely welded around the edges to seal the overlapped area.

When gas welding aluminum, remember these seven points:

1 — Flame adjustment: Torch should be carefully adjusted to show a neutral or slightly reducing flame.



EDGE PREPARATION: (A) Puddling rod is used for gas welding aluminum castings. (B) Plates 3/16-in. thick or more should be notched and beveled for best results. (C) Thinner plates need not be beveled. (D) Thin sheet (1/16 in. or less) can be flanged. Joint is then made by melting down flange with no filler metal needed.

2 — Filler metal: Commercially pure aluminum (2S) and metal of higher purity are generally welded with metal of the same purity; for 3S aluminum, 2S wire is recommended. In welding 52S, 53S and 61S alloys, a filler rod containing approximately 95% aluminum and 5% silicon is generally used. Strips may also be cut from parent metal and used as filler metal.

3 — Preheating: Aluminum sheet 3/8-in. thick or more, and any intricate castings should be preheated to 700-800 F. Sections thicker than ¼ in. should be preheated to 600-700 F.

4 — Distortion and buckling: Minimum distortion is obtained with edge or corner welds and in assemblies where weld bead can be located on a crown or radius. Location of welded seams or fittings in flat areas should be avoided.

5 — Welding flux: Flux should melt somewhat below welding temperature to break down surface oxide and, thus, permit liquid metal to flow into molten parent material. No. 22 aluminum welding flux mixed 3-to-1 with tap water forms a suitable paste for filler rod and joint.

6 — Cleaning: If both surfaces of the welds are accessible, cleaning can be done with a fiber brush in boiling water. For enclosed vessels which have joints located so mechanical loosening of flux deposit is not feasible, use acid dip.

7 — Finishing: For butt welds use a pneumatic chisel; chip bead edge almost flush with parent metal surface. Hammer the balance of the bead over a back-up block with blows heavy enough to work the metal through the entire cross-section.

Finish fillet and corner welds by grinding and filing. The tendency to load the conventional grinding wheels with aluminum can be overcome by using felt base wheels.

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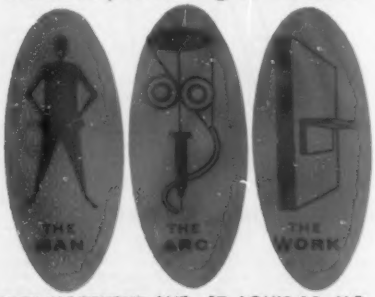

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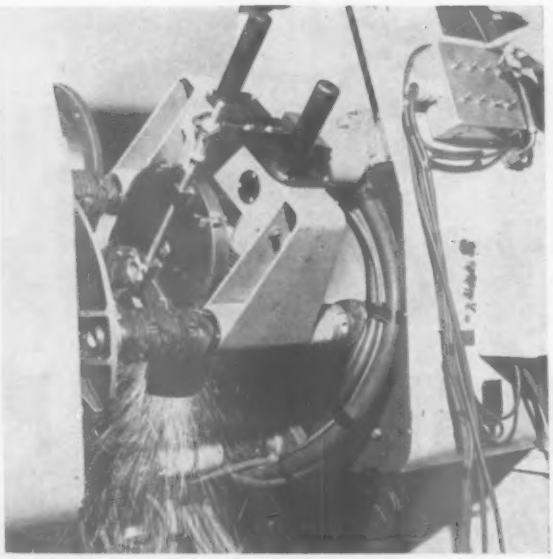

AUTOMATIC Mig welder lays 45 ipm bead in laboratory test of pipe line welding process.

Automatic Mig unit slashes field pipe welding time

AUTOMATIC PIPE LINE welding in the field has recently taken a giant step.

A device that clamps over and welds two lengths of pipe 20 times faster than possible with present manual metal-arc welding techniques has been developed by Esso Research and Engineering Co. and Air Reduction Sales Co.

Using present welding methods, 20 men may be strung out for a mile or more along the pipe. In the new process, only a welding technician, his assistant, and a tractor driver are needed.

The new method and automatic Mig welder are the result of several years of research and development. The welder has undergone a six month evaluation and a successful field test in the Odessa oil fields of Texas and is designed for use with 4, 6 and 8-in.-diameter pipe. The entire process, however, can easily be adapted for even massive 30-in. and larger diameter piping.

In the new process:

1 — Steel pipe is strung along the ditch in which it is to be buried. The tractor lifts the pipe and helps place the welder over the pipe ends. A specially-devised internal alignment clamp inserted in each pipe holds the ends firmly together and in line.

2 — When the welder is in position, it firmly clamps in place with its dual prongs. An air-driven abrasive cutting wheel then slices a minute sliver from each pipe end. The Mig welder follows in the cutter's tracks and performs the weld without rotating the pipe. The weld is made using 0.040-in.-diameter wire at 45 ipm. Power source is a 400-amp diesel-driven welder.

Specifications

Process: Mig
Speed: 45 ipm
Shield: argon, helium, or CO_2
Wire: 0.040-in. diameter
Power source: 400-amp diesel-driven welder

On 8-in. pipe, the weld is completed in one minute and is as strong as manual metal-arc welds requiring up to 20 minutes. After the cutter prepares the pipe ends, no further treatment of any type is needed.

When the weld is completed, the clamp is collapsed and withdrawn to the next joint.

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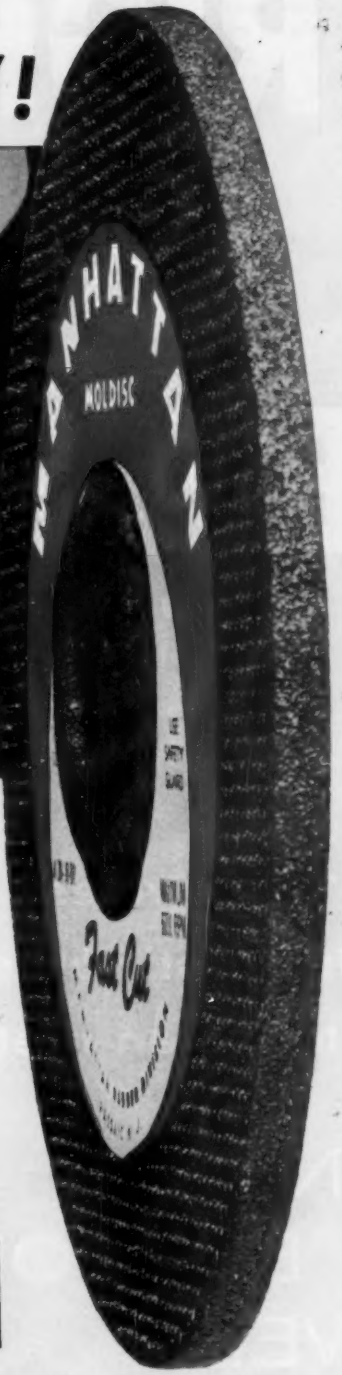

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BY

A.O. SMITH

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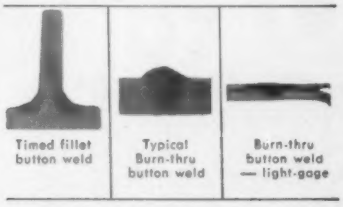

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Sprayed overlay cuts motor drive shaft production costs

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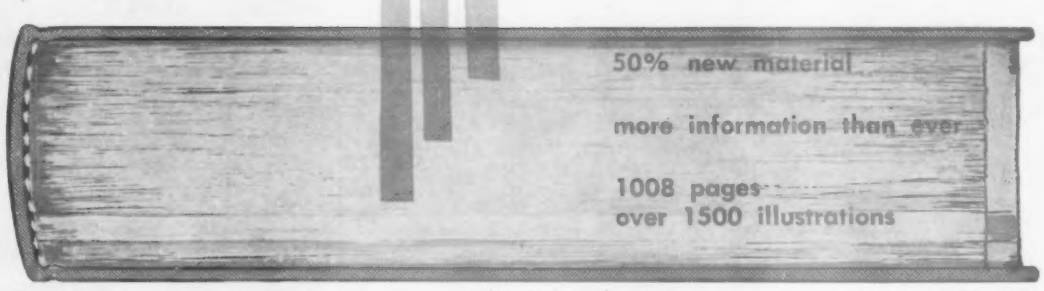

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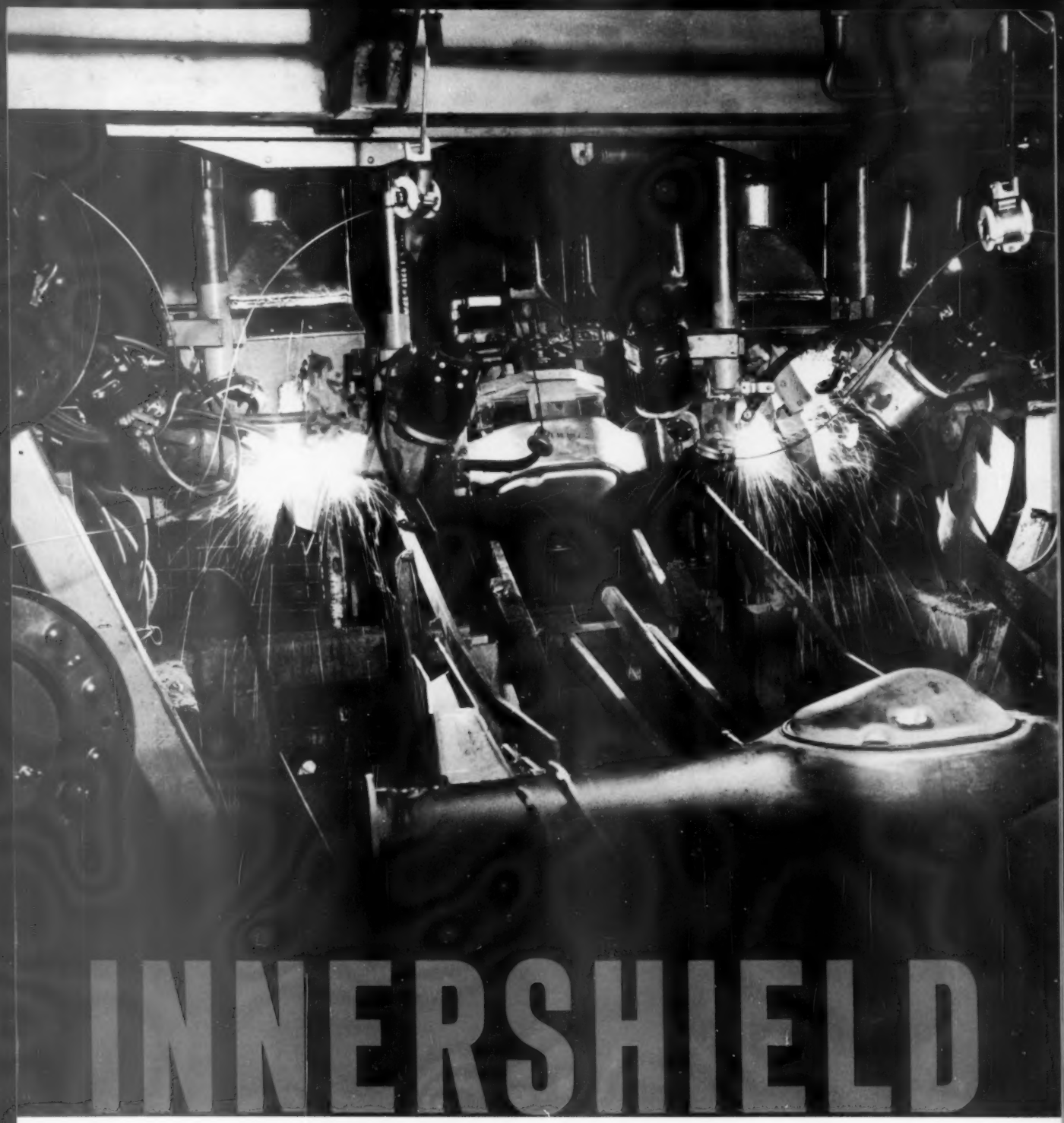

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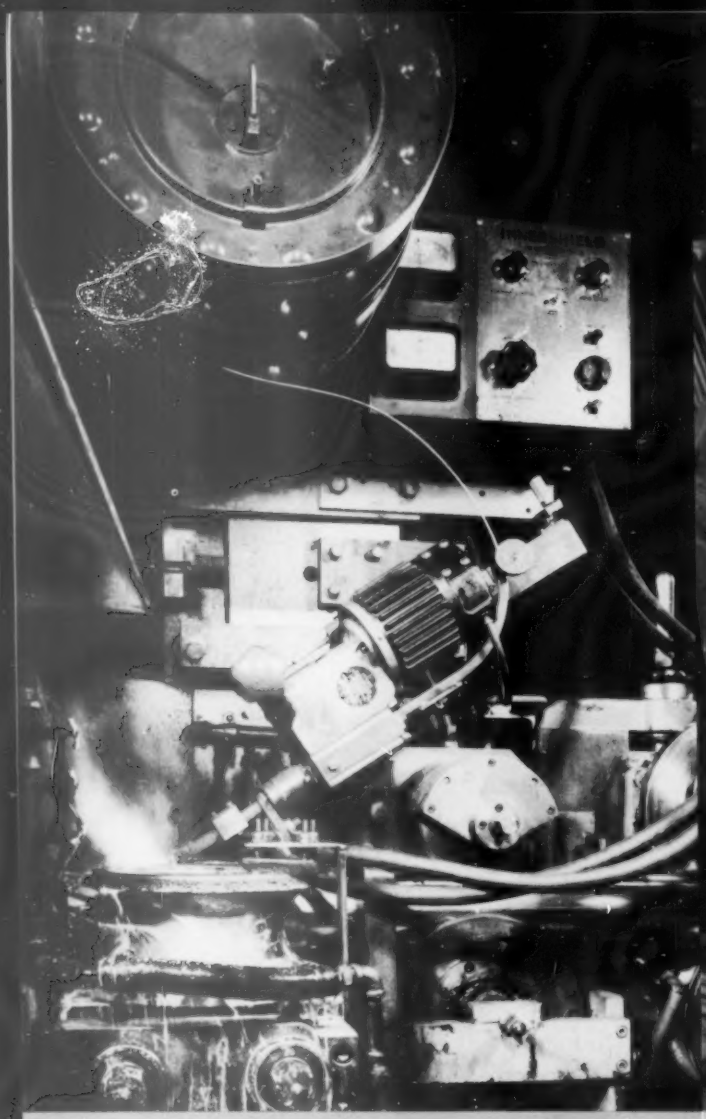

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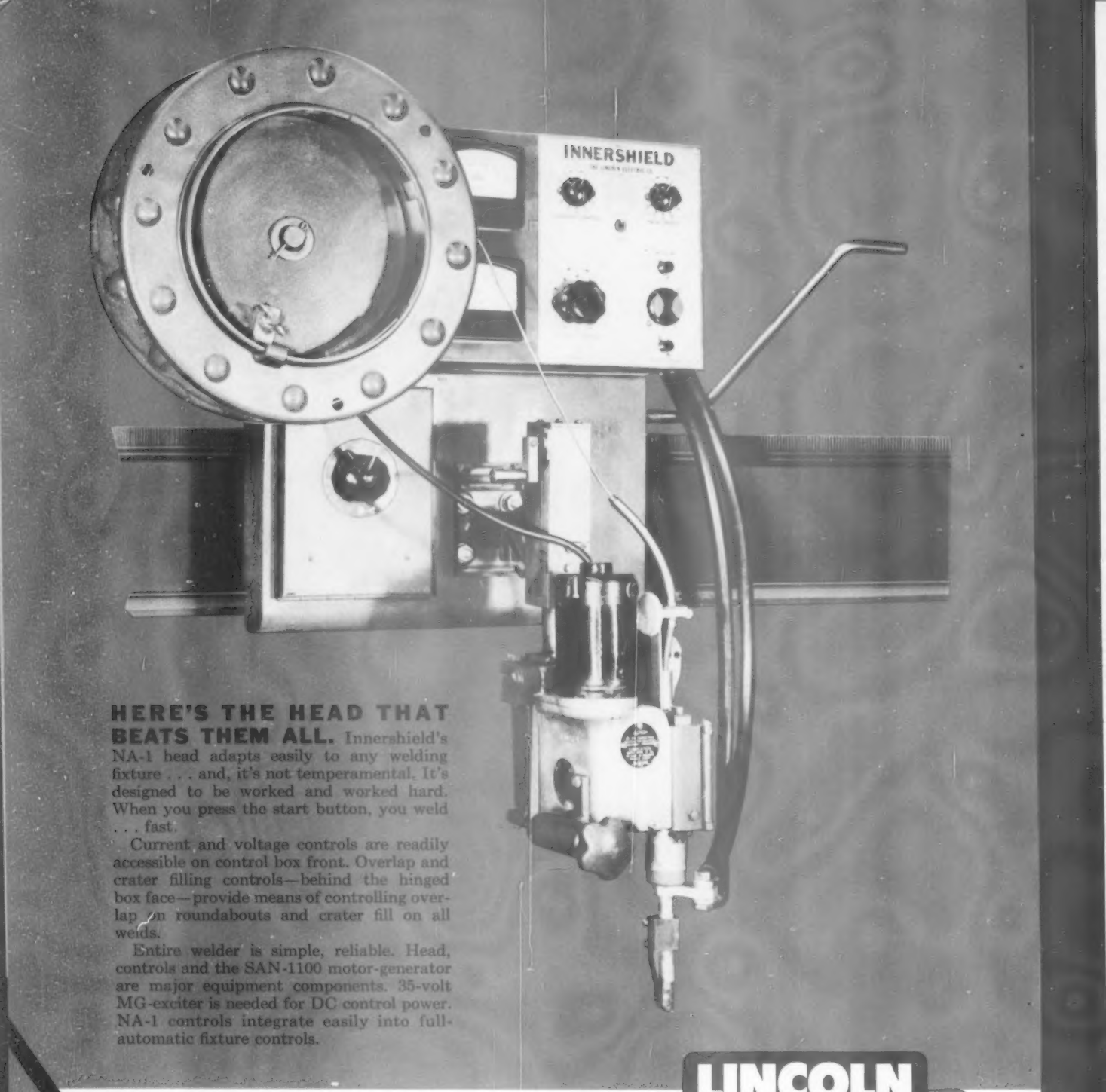

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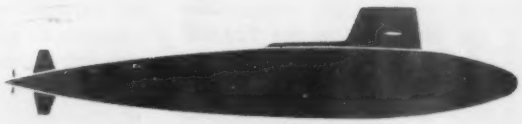

Welding HY-80

Survey of notch tough steels shows fabrication problems

EXPERIENCE GAINED in mass-production welding of ships during World War II resulted in the use of more notch tough materials.

Quenched and tempered low-alloy steels offered the greatest promise. Thus, a Navy material (STS steel) was modified to a low-carbon, nickel, chromium, molybdenum steel and classed as HY-80.

When quenched and tempered, it develops a yield strength of 80,000 psi in thicknesses up to 1¼ in. Used successfully for light armor applications on surface ships, it was welded with MIL-S-260 electrodes (comparable to the E12015-G).

With the advent of the nuclear submarine, it was realized that hull diameters would have to be increased to house the equipment necessary for atomic propulsion. Higher strength materials would also be required to withstand greater pressures in deeper water.

Thus, HY-80 steel was modified to two chemical ranges for better weldability. These alloys were then successfully quenched and tempered to the 80,000 psi minimum yield with Charpy vee notch values from 30-50 ft-lb at —120 F.

Development of the HY-80 continued into the 100,000, 125,000 and 150,000 psi yield points. The 100,000 psi yield material is being used in construction of an experimental hull structure.

Paralleling the Navy's work, commercial materials (T-1 steels) are now produced with similar strength characteristics and offer designers a new freedom. Titanium alloys, because of their notch toughness and strength-weight ratio, are expected to remove many of the present material limitations. They should be available within 10 years.

Notch toughness is a major criteria and probably the most difficult property to obtain in materials suitable for construction by welding. Maintaining ductility when welding large structures which cannot be post-heated presents many unique problems.

Thus, welding procedures must be devised that will not severely degrade the material in the heat-affected zone.

Welding HY-80 has presented problems in construction of high-resistant weldments such as submarines.

For successful welding, the materials require preheat, which must be limited to 300 F to (a) maintain the weld nugget's quench rate, (b) to obtain desired mechanical properties and (c) to prevent degradation of the heat-affected zone.

For these same reasons, the rate of heat input and the interpass temperature must also be controlled.

Table 1 gives the present required preheats, interpass temperatures (300 F maximum) and heat input limitations (80,000 Joules/-inch) as established in proposed Navy specifications.

Heat-affected zone of the weld metal is martensitic in structure with Rockwell C hardness numbers to 42. To control possible hydrogen in the weld and heat-affected zone, electrode coatings must be limited to a maximum of 0.2% moisture content (crystallization or combined).

To maintain this level during shipping and storage, electrodes are packed in hermetically sealed containers. But no system has been devised to insure that the seals are not broken.

Rigid controls (including re-baking heats, holding oven procedures and issuing of electrodes) have kept moisture content below the specified 0.2%, however.

If electrode moisture control and limitations on preheat and interpass temperature are not exercised, degradation of the bare metal heated by welding or an insidious type cracking will result.

This cracking seems to originate in the heat-affected zone and concentrates itself as either toe, underbead or transverse cracking. It can occur during welding (*e.g.*, in the root pass of double-welded full penetration joints), or after the weld is completed.

In the latter case, cracks may appear immediately after weld cooling or several days later, and

is sometimes called cold cracking.

Cold cracks start only in martensite and therefore occur chiefly in hardenable steels. However, any steel, if hard enough to form martensite in the heat-affected zone, is subjected to such cracking.

Weld bead application is varied to use a tempering bead technique. The degree and uniformity of tempering may be questioned, but practical experience indicates it is effective.

This implies application of a stringer bead at each toe of the weld, with other beads applied over it. The weld is finished toward the nugget center (figure 1).

Heating from the cover pass tempers the martensitic heat-affected zone of the previous bead deposited on the quenched and tempered material. Welding techniques used to give a gradual change of section are effective also in removing the crack-producing notch effect (figure 2).

During World War II low-carbon alloy steels were successfully welded without cracking by using austenitic stainless steel electrodes. These welds, however, were undesirable because of their low (compared to base metal) tensile strength.

The austenitic weld deposit had a very low or non-existent yield point which prevented development of high residual or reactional stresses by yielding to strains produced during welding. Another discovery was that the electrode coatings contained only minor amounts of hydrogen.

This led to development of a low-hydrogen, low-alloy, ferritic electrode (the Navy's type 260) which has strengths comparable to the base metal in the 120,000 psi range. There were two drawbacks, however. **(1) The as-deposited weld contained vanadium which produces temper brittleness. (2) Electrode characteristics made it difficult for fillet welding or tee joint preparation.**

Low-hydrogen, iron-powder electrodes were then developed to give greater arc stability and better weldability. But more important, the welds were improved considerably because of their much lower nil-ductility transition temperature. Thus, high notch tough welds could be made in assemblies using high-yield structural materials.

Much research has been performed on submerged-arc welding and other automatic welding methods, such as the inert-gas shielded processes.

[*Editor's note: Successful submerged-arc welding has been performed on 1-in.-thick material using a special rod-flux combination developed by the Mare Island Naval Shipyard, Vallejo, Calif. Preparations are being made for its application to submarine construction in these thicknesses while research continues on development of satisfactory procedures for thicker materials.*]

Inert-gas shielded welding, using 1%-oxygen/argon mixture with a controlled dew point to a very low value, produces satisfactory welds. Filler wire is designated as MIL-B-88.

The welds are surface smooth and wash into the base metal at the weld edges, showing a great improvement in weld contour, especially in tee joint welds. Unfortunately, welding is presently

Established temperatures for welding HY-80

Preheat for Welding and Tacking: The following table lists the minimum preheat temperatures required for welding HY-80 steel. The temperature shall be based on the thicker joint member.

Plate Thickness (Inches)	Minimum Preheat
Over 1½	200 F
Over ½ but not over 1½	125 F
½ or less	75 F

Maximum preheat and/or interpass temperature shall be 300 F for any plate thickness.

Preheat for Arc-Gouging: The minimum preheat temperature for arc-air gouging used for root backgouging or for repair shall be:

Plate Thickness (Inches)	Minimum Preheat
Over 1½	150 F
1½ and under	75 F

Heat Input: When welding HY-80, the limits for heat input as measured in joules per inch are:

Plate Thickness (Inches)	Maximum Joules/Inch
Less than 1⅜	60,000
1⅜ and greater	80,000

For computing the heat input (joules/inch), the following formula applies:

$$\text{Heat input (joules/inch)} = \frac{\text{voltage} \times \text{amperage} \times 60}{\text{Rate of travel (ipm)}}$$

TABLE 1 — Preheat, interpass and heat input temperatures as established in proposed Navy specifications.

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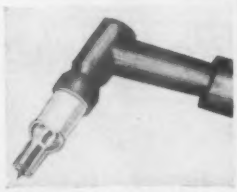

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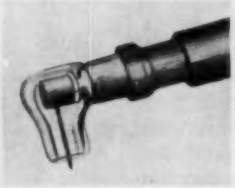

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limited to downhand positions.

While vertical welding has been satisfactory, the change of position, for some unknown reason, lowers the impact strength or notch toughness of the finished weld. In addition, the alloy filler wire contains vanadium, so welds cannot be heat treated.

Standard joint preparation for high tensile materials, with slight procedure modifications, are satisfactory for welding high-yield, quenched and tempered materials.

Complicated structures, such as ships and submarines, contain components that are extremely difficult to weld, especially without producing cracks.

For example, a cruciform assembly is often used in submarines and in tank designs on internal stiffening members under high restraint. Forged sections with butt welds away from the cruciform are being considered for improved weldability where this design is desired.

Use of high-yield strength materials and the tendency to root cracking dictates limited use of fillet welds. The open root of a fillet weld or partial penetration joint is a common area of crack initiation and propagation in crack-sensitive materials.

Corner joints are always a problem, and even more so in high-yield materials because the heat-affected zone at the weld's toe is susceptible to cracking by reactional stresses. Some progress has been made in forming round corners with butt welds away from the corner. Such corners have greatly improved design and eased construction problems when using high-yield materials.

Fitting lugs and other necessary attachments for moving materials into line present dual problems because of: (1) the heat-affected zone left in the base metal from attachment of lugs, etc., and (2) an attempt to keep the reactional and residual stresses to a minimum by good fitting.

While some postheat treating is possible and present specifications allow stress relief at 1,025 F, ± 25 F, for one hour per inch thick, this cannot be performed on weld metal which is temper brittle.

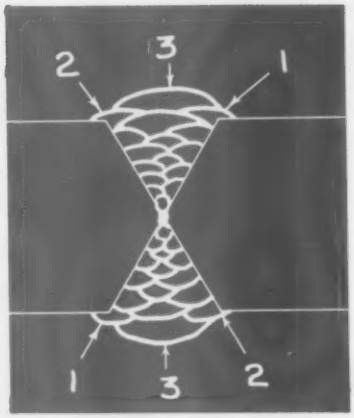


FIG. 1 — Heat-affected zone of passes 1 and 2 will be annealed by bead 3.

This low-temperature stress relief treatment is not too effective in removing residual stresses because of the material's high strength at this temperature. Therefore, the designer must make greater allowance for machining than that on materials which can be heat treated to a lower level of residual stresses.

High-yield materials can be flame-cut using oxy-fuel gas cutting methods. The flame-cut edges, however, produce hardened zones in the base metal similar to the heat-affected zones in welding. Attempting to control this with pre- or post-heat treatment during cutting is impractical.

Flame-cutting produces satisfactory edge preparation for weld deposits when cleaned of slag residue.

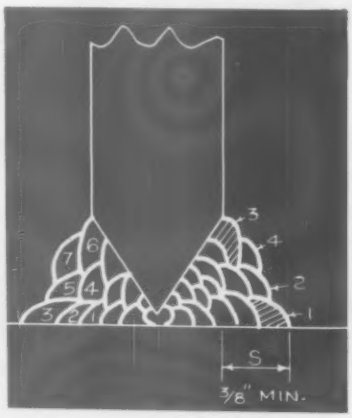


FIG. 2 — Temper bead technique and simulated convex fillet radius are desirable for toe joints. Cladding technique (left) is preferred by some.

But long, flame-cut, chamfered edges for production of gradual changes of section between members of different thicknesses have produced, in many cases, microcracking. Because of the heat-affected zone's hardness, they are subjected to cracking from reactional stresses due to loading.

Present specifications require post-heat treatment at the stress relief temperatures mentioned above to reduce this hardness and/or the complete removal of the heat-affected zone by machining or grinding. Also required is magnetic-particle inspection for cracks on flame-cut edges in materials 2 in. or more in thickness.

Back gouging of welds or repair gouging must be considered in light of base metal degradation in certain temperatures. Grinding is satisfactory but expensive; arc-air gouging is quite satisfactory and well within heat input limits.

The hard heat-affected zones in these materials present problems when applying low-melting-point alloys. Stress corrosion cracking has been noted, for example, in application of lead-tin alloy solders with their required fluxes.

Therefore, careful consideration should be given before applying any such alloys to high-yield quenched and tempered materials. Pure metals, such as lead, apparently do not produce stress corrosion cracking, while zincs, tins and some other materials do. Overlays of non-ferrous alloys (Monel, high-nickel alloy, silver solder) are successfully applied.

The welding sequence also becomes increasingly important when using high-yield materials. Butt welding can be done successfully if a block welding technique is used. A good welding sequence should be established and rigidly maintained.

To assure that shipfitting will enable proper welding performance, welding supervision should be on an equal level with shipfitting supervision.

(*For a reprint of this article, circle number* 250 *on the Welding Info-Aid Card, page* 123.)

World's champion corn picker welded with M&T Murex electrodes

In the past eight years, five championships have been won by farmers using the New Idea corn picker. It is also the world's biggest selling brand. For the kind of welds that contribute to championship performance year after year, the New Idea Division of Avco Distributing Corporation depends on M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

by F. B. Jacob
Vice President
Thomson Electric Welder Co.

Welded saw blade joints must meet rigid specifications

Few areas of manufacturing impose more stringent criteria in flash butt welding than production of saw blades. Welds must withstand continual flexing cycles; weld times must be brief; annealing must be thorough.

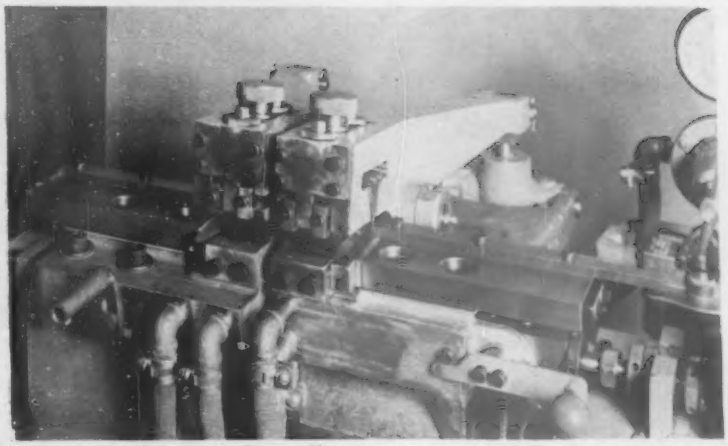
INCREASED USE of high-speed saw blades has demanded new and more qualitative requirements from welded joints.

Flash butt welding techniques and equipment are different for wood-cutting and for high-speed metal-cutting saws. Each has its own welding criteria and one welder can seldom be used for both applications.

Among wood-cutting saws, especially band saws, size noticeably influences the welding operation and equipment.

A work piece cross-section, if large, demands higher currents and longer weld times. If small, it causes support problems and possible buckling from weld pressure and upset force.

Operating speeds, another important variable, also are increasing. For example, a 50-ft band saw often may run at 11,000 ft. per minute and



COMPACT flash butt welder is designed specifically for welding high-speed saw blades. Clamps have socket arrangement to insure equal distribution of clamping pressure. Annealing controls are at left.

World's most efficient power plant depends on M&T Murex electrodes

To get more electricity than ever from a ton of fuel, Philadelphia Electric's 325,000-kilowatt Eddystone No. 1 generating station superheats steam to 1200°F, 5000 psi pressure. No other power plant equipment handles steam at such high steam conditions. In welding most of the pipe for Eddystone, The M. W. Kellogg Company used Murex electrodes — products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

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PRODUCTS FOR BETTER WELDING

bend 440 times. Such flexing subjects the weld joint to severe stresses and demands unusually high physical properties.

To predetermine weld quality by applying upset force at the proper time, a mechanism to synchronize flashing and upset cycles was developed.

Previously, cams or manual movements were used to apply force when parts reached the plastic state. Inertia, however, complicated the cycle and affected weld quality. Slight variation in timing caused unsound welds.

The mechanism coordinates flashing and upset automatically. Synchronized with the machine cycle, an air cylinder actuates a crank which moves a platen to which one of two parts is clamped.

A snubbing cylinder, acting against an oil cushion, operates with a check valve and the crank to control exerted pressure at any given time.

To weld blades of different sizes or of dissimilar composition, adjustments can be made easily by the operator.

For a carbon steel saw blade to withstand operating stresses, the weld must be annealed, either in an annealing unit or in the welder itself. The choice depends on degree of temperature time control desired.

High-speed metal-cutting band saws present more complex problems for both flash butt welding and annealing because of metals used and subsequent operating requirements.

These band saws are usually made of tungsten or molybdenum and outlast conventional metal-cutting saws by about four to one. With such high-strength metals, blades are very small (some standard sizes range from ½ by 0.025 in. up to 1 ¼ by 0.042 in.).

The metal-cutting blade has a hardened edge and a flexible back to allow bending over the wheels. Should the blade crack, it cannot be reset or rewelded.

Due to metal properties, the weld area is very brittle and easily fractured. Therefore, annealing the weld as soon as possible is a must, and preferably in the flash butt welder.

Many large plants are now using such custom-made welders. One such welder, manufactured by Thomson Electric, features a special clamping arrangement and integral annealing controls.

Besides band saw welding, there are numerous areas in which resistance welding offers distinct advantages in time, cost and ease of joining:

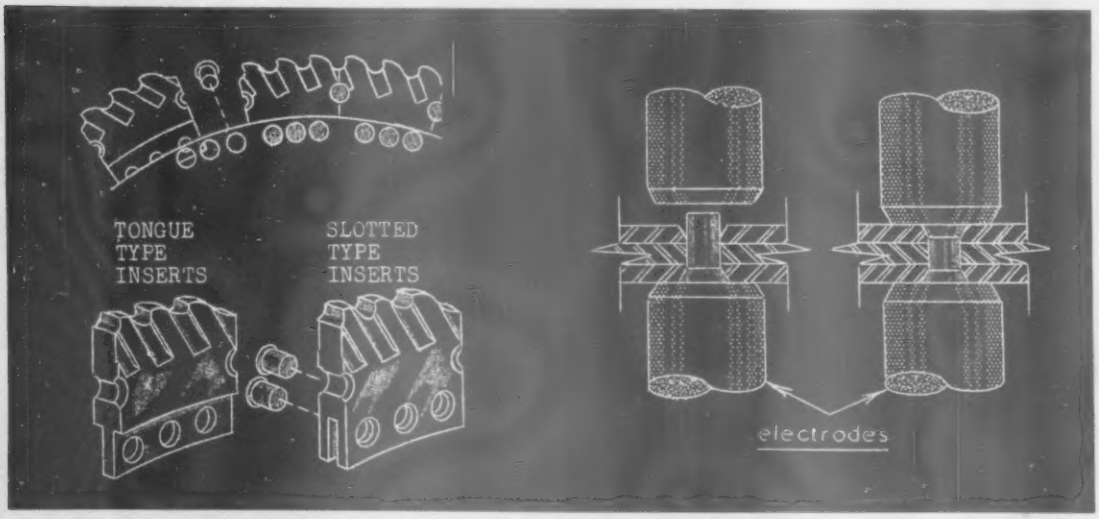
(1) Flash butt welding of belt knives used in the leather industry. Typical assembly size is about 0.050-in. thick by 3¾-in. wide, usually low-carbon steel. Welding procedures and equipment are similar to those for wood-cutting saws.

(2) Spot welding steel tabs to gang saw ends. Clamped together in gangs, the blades, measuring about ⅛ by 6 by 42 in., have tabs at each end for mounting.

(3) Spot welding three sheets together to form a chain saw frame. Sheet thickness averages 0.080 in.; widths vary with saw model and capacity.

(4 Spot welding hole saws. Relatively short segments of hack saw blades are wrapped around a circular steel hub and spot welded to it.

(5) Press welding solid rivets in segmented circular saws (see drawings). Low pressure is applied during heating cycle. Each rivet is heated and upset in five seconds.



SOLID rivets are hot-upset in segmented circular saws. Inserts are either tongue or slotted types. Each rivet can be heated and upset in five seconds.

World's largest single-engine crawler welded with M&T Murex electrodes

The giant Caterpillar D9 tractor is a mountain of earth-moving muscle with a pull of 67,190 lbs. Using its seven-roller tracks, the Cat crawler can claw into the earth, push huge boulders, maul tons of dirt. The average tractor is dwarfed by the size of this monster: 23 feet long and weighing over 75,000 pounds, with equipment. In building its D9 line of crawlers, Caterpillar Tractor Co. used Murex electrodes – products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

18 HOURS IN A CEMENT MIXER...

(And $1.93 put it back in working condition.)

How much of a battering can a torch take and still keep working? Here's a test which Smith's engineers devised to find out just how rugged Smith's new heavy duty torch is:

The torch was tossed into a turning cement mixer where it clanked and flopped for 18 consecutive hours. At the end of that time, they stopped the mixer and removed the torch.

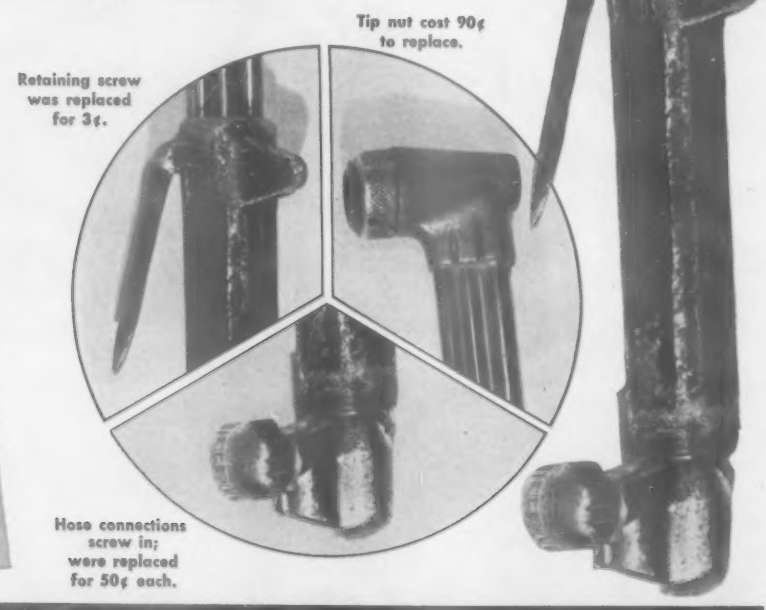
Damage? The retaining screw on the cutting lever had dropped out (cost 3¢); hose connections had broken off (they're removable by design and cost 50¢ each); and the tip nut was out of round (cost 90¢). The photos show the scars of battle.

The point is that by replacing a retaining screw, two hose connections, and a tip nut, the torch was back in operating condition. Total cost: $1.93.

You may never have occasion to give your torch a trip in a cement mixer, but whether you're a burner or a bill payer, down time and repair costs can hurt. This torch can cut them to a minimum.

The best part of the story is that for fast, efficient cutting, this torch is unsurpassed, whether for 24 gauge or 24 inch steel. We call it "Tuf-Tony, the Metaleater." Ask your Smith distributor for a demonstration or write for more information:

New! 4-color wall charts showing flame traits of oxy-acetylene and oxy-LP gas in cutting, welding and brazing. Your's for the asking. See your Smith distributor or write Smith's.



SMITH'S

SMITH WELDING EQUIPMENT CORPORATION
2633 Fourth Street S.E., Minneapolis 14, Minnesota

WELDOR prepares to weld ¼-in. bar which has been tacked to a ½-in.-thick end piece at the U.S. Naval Weapons Plant, Washington, D. C.

Mobile units cut welding time at weapons plant

Semiautomatic CO_2 flux core welding rigs speed heavy steel plate assembly at U. S. Naval Weapons Plant

EIGHT SELF-CONTAINED CO_2 flux-cored welding rigs are speeding heavy steel-plate assembly at the U. S. Naval Weapons Plant, Washington, D. C.

These semiautomatic mobile welding stations move easily to work locations or are adaptable for semi-permanent positioning for production runs.

Each mobile unit is assembled by mounting a welding power supply, control unit, welding gun and hoses on a dolly. The units also include a supply of CO_2 and a self-contained cooling system consisting of radiator containing eight quarts of coolant and a circulating pump.

Because the shielding gas and coolant supply travel with it, the unit needs electrical service only where it operates.

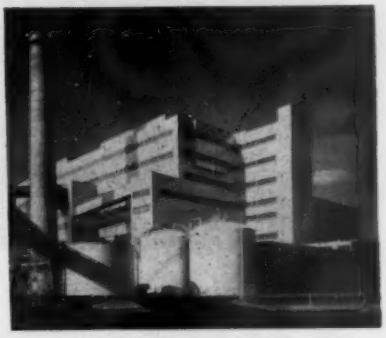
All units were either originally designed for, or have been converted to, this Dual Shield process made by National Cylinder Gas, Division of Chemetron Corp., Chicago.

The process uses a flux-cored electrode and CO_2 as a shielding gas. The flux core also contains a slag forming agent which causes slag to rise to the molten weld metal surface and literally pop off as it cools.

The Weapons Plant reports that welding time has been substantially reduced wherever the mobile units have been used.

On one job — involving a 219-in.-diameter cylinder component, from ½ and ¼-in. mild steel plate with about 60 ft of welds—welding time was cut 1/7 from that previously required with manual metal-arc welding.

Champion picker



Most power

Largest crawler

Any electrode that performs well on demanding jobs like those shown on the previous pages is qualified for the everyday tasks. You can choose from such important types as:

Iron Powder—for heavier and faster laydown of material than any other type of electrode.

Low Hydrogen—for a high quality weld on high tensile, chrome and carbon molybdenum steels.

Stainless Steel—for a weld to match the parent metal quality. Packed in new, safer resealable telescopic aluminum containers.

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M-T MUREX welding products

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General Offices: Rahway, New Jersey
Circle No. 196 on Info-Aid Card

From subject . . .

. . . to camera

Successful use of television by AWS school solves many problems connected with large group teaching

Closed-circuit television aids welding instruction

. . . to control room

. . . to tv set

by Arthur L. Phillips
Secretary, Information & Education
American Welding Society

CLOSED-CIRCUIT TELEVISION has solved one of the big problems in welding instruction — how to show mechanical movements, operating parts and the like to large groups.

In arc welding operations, for example, shields must be used to protect the eyes from intense light and, in addition, it is almost impossible for more than six people to obtain a good view of the arc at one time.

Closed-circuit television permits an unlimited audience to obtain a better view than would be possible with a bench demonstration.

At its School of Welding Technology, AWS has made good use of this teaching medium. Engineers in widely differing fields were given an intense course on inert gas shielded-arc welding with the aid of television.

The class of 50 had to be shown a tremendous variety of equipment. More than a dozen manufacturers could have been involved in the power sources alone and an even greater number could have supplied the shielding gas. The welding equipment itself presented the most difficult problem — more than 20 different companies supplied the inert gas shielded-arc welding equipment.

Moreover, any equipment selected as representative of the process could be incorrectly assumed to carry AWS recommendation which would be unfair to other manufacturers.

This problem was solved by using schematic drawings and closed-circuit television.

The television facilities of the New York Trades School were made available for an entire afternoon and the class was transported to the school and assembled in the auditorium where the four television screens were located.

Television equipment needed for the AWS project consisted of two cameras, necessary microphones, monitors and other equipment. All such equipment was constructed and operated by the electronics students of the New York school.

Each camera was focused on a particular area: one on the commentator and the other on the operation area. Fixed camera positions eliminated the need for elaborate booms and other costly equipment requiring increased space and manpower.

Demonstrations were televisied from the school's welding laboratory and classes continued up to program time.

Because of variables involved, both commentator and technicians had additional material to describe or demonstrate if needed. The need did not arise, however, and the program covering Tig welding and cutting, and Mig welding was presented without any problems.

After the moderator described the program, the four television screens in the auditorium showed the various welding and cutting operations. After each demonstration, the picture switched to the commentator who explained the operation and, by means of duplicate prepared samples, showed a close-up of the completed weld.

This procedure prevented loss of time and avoided lack of continuity. Two way communication was maintained through the public address system and a traveling microphone transmitted questions.

Problems involved in televising the three-hour show included:

1—the need for the commentator to talk to a camera lens rather than to an audience, and at the same time to watch for signals from the camera crew.

2—the inability of the commentator to judge reactions of an unseen audience.

3—the confining of the principals to a relatively small area because the cameras were fix-focused.

The script itself consisted of two typewritten sheets listing the demonstrations and their approximate timing. Lengthy commentary and detailed instruction were unnecessary because each speaker was an expert in his field. Rehearsals familiarized the speakers with the layout and hand signals.

In addition to the 50 engineers, approximately 100 students from the New York Trades School attended. Without closed-circuit television, it would have been impossible to demonstrate the operation of the welding arc and show the latest developments in the process to so many in so short a time.

. . . to audience

STEEL sub-assembly shows steel hook brazed into place on upper end of channel.

Nickel-silver brazing solves stapling machine production problems

by Jack Poulson
All-State Welding Alloys Co., Inc.

TO FABRICATE INTRICATE STAPLING machine sub-assemblies on a production basis, Bostitch, Inc., East Greenwich, R. I., turned from spot and Tig welding to nickel-silver brazing.

Production brazing with nickel-brazing alloy and an automatic fluxing system has saved the firm nearly $1,000 in one year on one part alone.

TO SPEED brazing, a hand-operated clamp holds small stapling machine sub-assembly. Spring clamp is mounted in an air-operated vise.

Among specifications that had to be met were:

1 — close tolerances — to 2/1,000 of an inch.

2 — post-joining heat-treating operations to 1,600 F on small intricate parts fabricated from several different steel and copper alloys.

3 — no heat distortion.

4 — constant alignment during manufacturing.

5 — high-strength bonds that withstand rugged pounding and vibration.

6 — minimum aftercleaning and finishing and preparation of each part for chrome-plating.

Spot welding did not meet tolerance specifications and tended to crush delicate parts. Tig welding was too expensive and required additional finishing.

After testing the brazing alloy and automatic production fluxing system made by All-State Welding Alloys Co., Inc., White Plains, N. Y., Bostitch established a series of operations for its use.

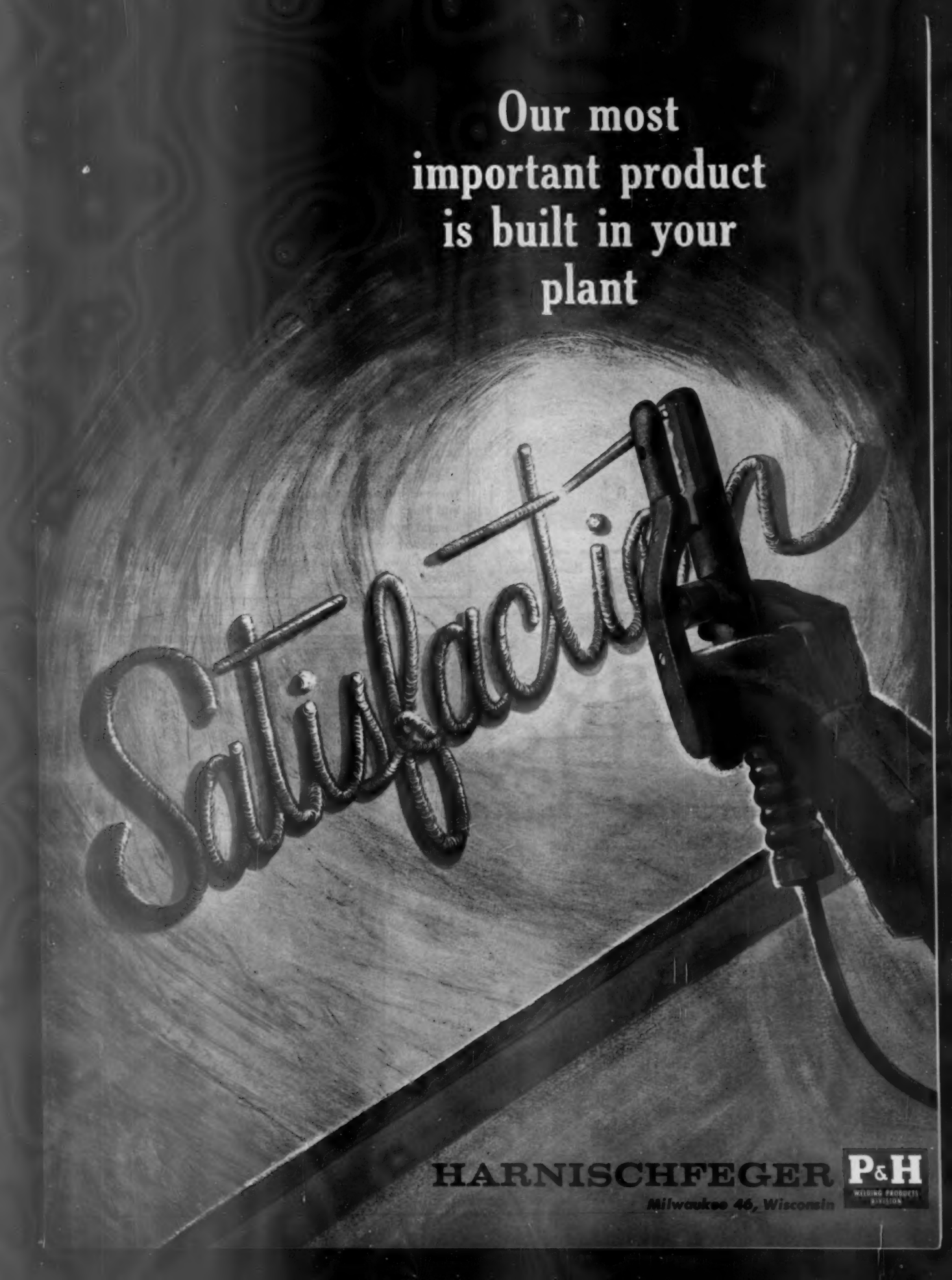
In one operation, cold-rolled Stanley L-5-C steel channel (0.24-0.31% carbon, 0.40% maximum phosphorus, 0.10-0.25% silicon, 0.30-0.60% manganese, 0.05% maximum sulphur) is formed from 10-in.-ID, 24-in.-OD coil.

The channel is pierced, prelanced, daped, blanketed, serrated and lanced. Then a 1/16-in.-diameter steel wire hook is preplaced in the 2 3/8-in.-long channel, allowing only 2/1,000-in. tolerance in positioning.

The pre-brazed position of the steel hook is maintained by placing the assembly in a specially-designed manual work holder that fits into an air-operated clamp, ready for brazing.

The brazing filler metal is rapidly built up in the lanced holes, joining the steel hook to the steel channel. The operator has enough control to form a smooth fill, flush with the channel top, eliminating

For more facts Circle No. 197 on Welding Info-Aid Card →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Satisfaction
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WELDING PRODUCTS
DIVISION

SUB-ASSEMBLY for large industrial hammer-type staplers are also brazed with nickel-silver and automatic fluxing. Overlapping of pieces speeds brazing.

grinding. If finishing is needed, light brushing or belting removes excess material.

Next, the small sub-assembly is case-hardened at 1,600 F, oil quenched and drawn at 550 F to 63-67 Rockwell on the 30N scale.

The final step is chrome-plating. Chrome is deposited 0.0003-in. to 0.0005-in. thick over the entire surface of the unit.

In a similar operation, a machined block is brazed to the head of a steel channel. In this case, the piece is so deep that flux-in-flame will not penetrate the entire brazed area. Application of a small amount of proper paste flux insures capillary flow to hard-to-reach parts.

SPOT WELDING AND VARIOUS other welding methods are still used by Bostitch in assembling stapling machines.

As a result of a large number of rejects of expensive, machined copper spot welding tips, an additional fixture was designed for standard tips to eliminate wear on contact surfaces.

To make this fixture, an RWMA Class 10 copper-tungsten insert is brazed on the standard electrode at the contact point. Using nickel-silver alloy and flux, a bond is formed that will not melt at normal spot-welding electrode temperatures. As the insert wears down, remelting of the nickel-silver allows removal and replacement of the worn insert.

THE NEW

EMERSON ELECTRIC TIG-WELD 295

...Welds 'Most Everything

The EMERSON ELECTRIC TIG-WELD 295 has built-in high frequency . . . permits Tungsten inert gas and manual stick electrode processes to weld Cast Iron, Rimmed Steel, Carbon Steel, Stainless Steel, Alloy Steel, Nickel, Copper and Copper Alloys, Aluminum and Magnesium. It's a complete welding shop in a compact package . . . fully rated 295 amps with currents as low as 13 amps.

LOOK AT THESE FEATURES

- Variable gas and water afterflow
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THE TEST:
Radiographic Examination, Consolidated Edison Atomic Generating Station

THE SOURCE:
Iridium 192

THE MATERIAL:
Weld joints of 20" Diameter Chrome Molly Pipe

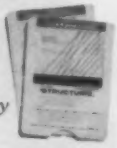
THE FILM:

GEVAERT **STRUCTURIX D7** X-Ray Film

Gevaert Structurix is specified where optimum penetration is needed, as in a recent gamma ray examination by N. Y. Testing Laboratories, Inc. Shooting was conducted through two walls (1.021" sw) to complete a 100% examination of the total weld area of 20" diameter chrome molly high pressure steam pipe in accordance with MIL-STD-271A requirements.

In laboratory or field, industry increasingly calls for Gevaert Structurix films for a probe in depth of structural quality. In their test for hidden flaws, these films search deeply, offer greater readability and have a sturdy base that facilitates handling.

Gevaert Structurix Films are available in five types, each designed to excel in its specific job application. Your inquiry for complete details and professional samples will be answered by the Gevaert branch office nearest you.



FREE! *Write for handy Exposure Calculator for either Co 60 or Ir 192 Radiography of Steel. Specify the one desired!*

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GEVAERT

For more facts Circle No. 199 on Welding Info-Aid Card

In one-week session:

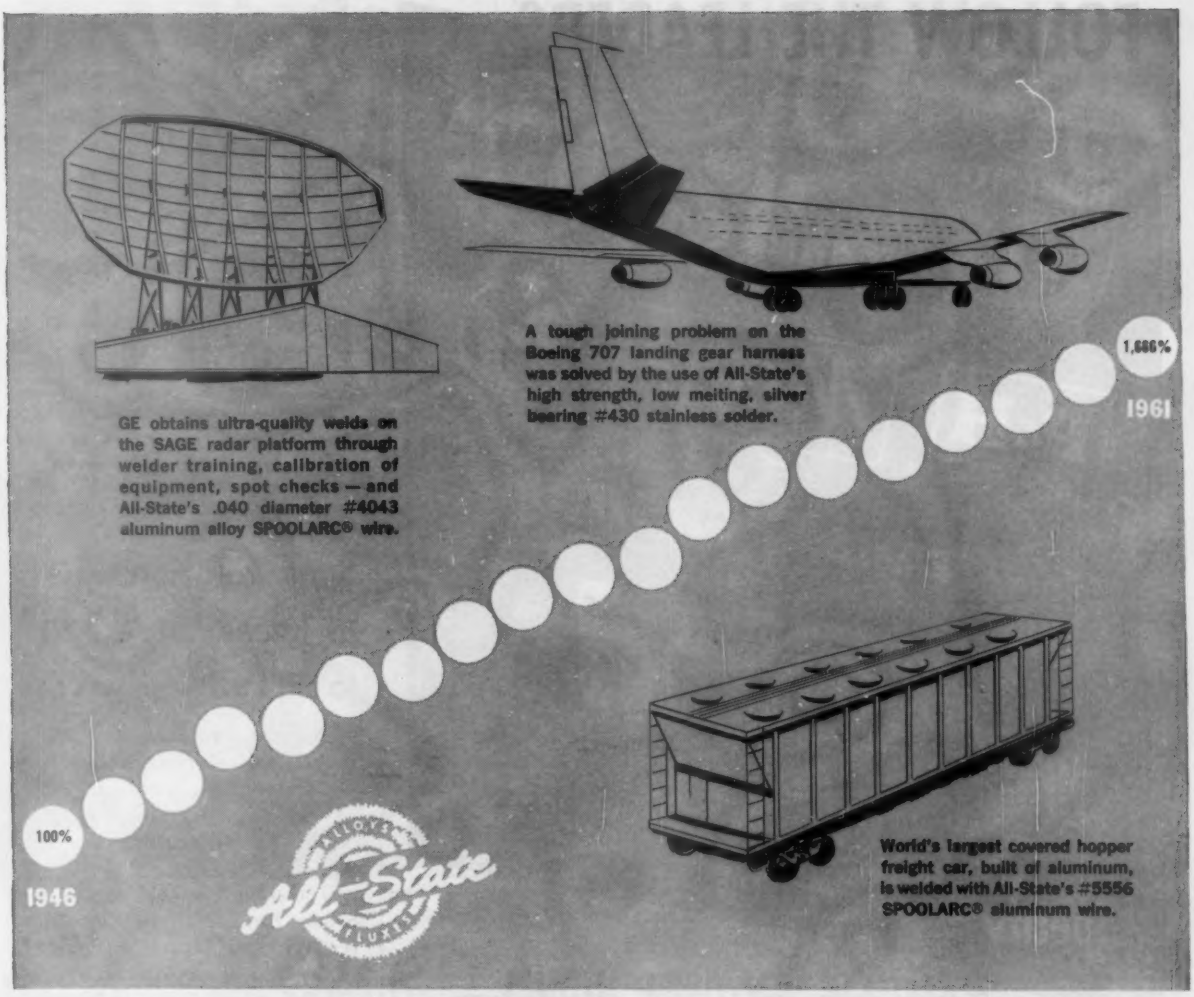
Almost 25,000 attend heating, air conditioning exposition

ALMOST 25,000 PERSONS attended the one-week 15th International Heating & Air-Conditioning Exposition at Chicago's International Amphitheatre recently.

The exposition was sponsored by the American Society of Heating, Refrigerating & Air Conditioning Engineers during its semi-annual meeting. Visitors included 3,000 members of the society and people from all over North America and 20 or more overseas countries.

Exhibits included every facet of the air-conditioning industry including space heating and cooling, as well as apparatus for liquid cooling, chilling and freezing.

Pictured here are some welding and allied industry manufacturers who exhibited.


GE obtains ultra-quality welds on the SAGE radar platform through welder training, calibration of equipment, spot checks — and All-State's .040 diameter #4043 aluminum alloy SPOOLARC® wire.
A tough joining problem on the Boeing 707 landing gear harness was solved by the use of All-State's high strength, low melting, silver bearing #430 stainless solder.
1,666%
1961
100%
1946
All-State
World's largest covered hopper freight car, built of aluminum, is welded with All-State's #5556 SPOOLARC® aluminum wire.

Thank you for your joining problems

...they helped us grow!

In just 15 years ALL-STATE has become a leading manufacturer of more than 100 specialty alloys and fluxes, thanks to the joining problems put to us by distributors, welders and welding engineers. In the solution of these problems we have won your confidence which helped us bring out new problem-solving specialty solders, brazing and welding rods, and fluxes.

In keeping with the rapid expansion of our quality welding alloys, we announce the addition of silicon bronze, deoxidized copper, aluminum bronze and phosphor bronze to the *Spoolarc®* line of automatic welding wire.

The *Spoolarc®* brand leads production of aluminum alloys at ALL-STATE — the largest manufacturer of aluminum welding wire in the U.S.A.

So, as we look ahead to the next 15 years, we repeat our standing invitation: if you have a joining problem — any joining problem with any metals — send us the essential details. We will solve it if we can — and it will not cost you a penny.

Visit our Booth 529 at the Welding Show

ALL-STATE WELDING ALLOYS Co., Inc.

WHITE PLAINS, NEW YORK — QUALITY WITH SERVICE

APRIL IS NATIONAL WELDED PRODUCTS MONTH — VISIT THE A.W.S. WELDING SHOW

Send for free copy of 56-page Instruction Manual

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See for yourself why the leading welding equipment manufacturers specify CAM-LOK Connectors, Receptacles and Plugs on many of their products. Write for complete line catalog, or detail your special requirements.

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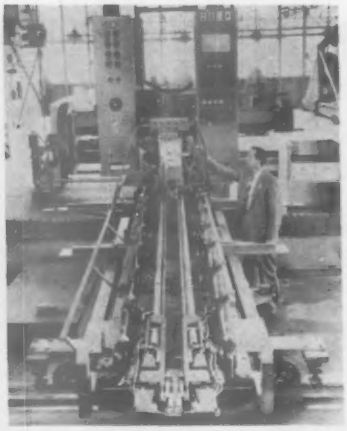


Extended reach welder will be used to join heat-resistant heat-treatable alloys in the B-70 intercontinental bomber program.

Spot welder reaches as far as 150 in. to make blind welds

FOR THE PAST YEAR, a specially-designed resistance welder has been producing critical spot welded joints in stainless steel for North American Aviation's Los Angeles division.

The blind welder, made by Sciaky Bros., Inc., Chicago, can reach 150 in. into an opening 3 in. by 8 in. to perform welds.

In welding wing structures, work pieces become part of the welding unit through reference guides assembled in them prior to welding.

There are four basic fabrication steps:

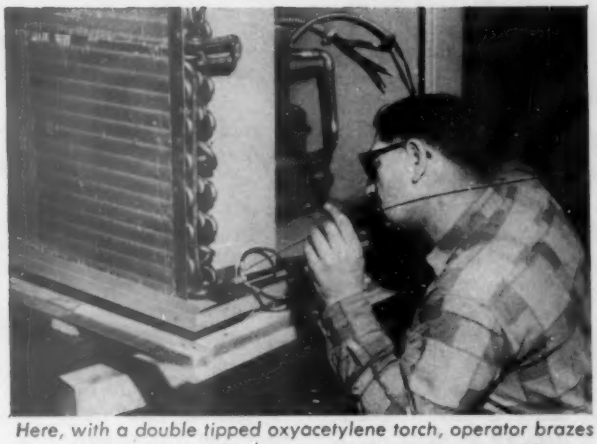
1—Spot welds are made with a portable gun welder to fasten corrugated shear web to shear cap at faying surfaces.

2—Tee bars, to guide welder, are inserted back-to-back into the confined space with shear web in between.

3—Top skin section of wing is placed over shear web and welder is inserted into tee-guide bars. A rack arrangement with variable speed d-c gear motor moves welding equipment which accurately places the spot welds.

4—Gun is removed and, from a remote location, a quick release wire and wedge lock mechanism removes tee-bars.

HOW TO MAKE 4,999 JOINTS WITHOUT FAIL



Here, with a double tipped oxyacetylene torch, operator brazes condenser coil joints. This condenser-compressor assembly contains 30 hook-up joints, not counting return bends.

The unit evaporator, located inside the house, contains 36 hand-brazed SIL-FOS 5 joints.

International Heater Does it With HANDY & HARMAN SIL-FOS 5

Production statistics of this manufacturer of heating and air-conditioning equipment show that perhaps one in five thousand hand-brazed joints may need touching up. This is a micrometer measurement away from absolute perfection.

One of the Utica, New York company's products is a home air conditioner that utilizes the existing duct work of the structure's hot-air furnace. Its novelty lies in the fact that the unit's compressor and condenser are located outside the house for noise-free coolness inside the home.

The unit's evaporator is installed on top of the furnace for simple tie-in to the plant's ducting for hot-weather operation.

Shown here in production is International's Model 5-5B of 5 ton capacity.

This "joint in quantity" record is being duplicated by SIL-FOS 5 silver alloy brazing in the manufacture of heating, air-conditioning and refrigeration equipment everywhere. Its strength, air-and leak-tightness and ease of application are some of the reasons that make Handy & Harman SIL-FOS 5 brazing one of the *surest* metal joiners in existence. We'd like you to know more about SIL-FOS 5 and the job it can do for you in joining copper and copper alloys in any shape, size and complexity. Our Bulletin 20 deals with this in a complete and informative manner. A request to Handy & Harman, 850 Third Ave., New York 22, N. Y. will bring you your copy.

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For more facts Circle No. 202 on Welding Info-Aid Card

WELDOR uses flux-cored CO_2 process to weld 1020 steel rolls.

Industrial steel rolls are welded faster with deep penetration as . . .

Flux-cored process makes 5-ft pass in 80 seconds

EIGHTY SECONDS WAS ALL it took for Barclay Machine, Inc., Sebring, Ohio, to make a 5-ft pass for a fillet weld with a flux-cored CO_2 process.

The welding was part of the fabrication of rubber or neoprene-covered rolls widely used in steel and pelletizing mills, and in glass, rubber and paper plants.

Flux-cored CO_2 welding equipment for the project was made by Arcos Corp., Philadelphia.

Welding involved joining 1020 low-carbon steel — a 20-in. OD by ½-in.-thick blank — to a 20-in. ID by 1-in.-thick collar and then to a center shaft. Edges were flame cut.

In the process, a deep-penetrating visible arc allows the weldor to compensate for minor irregularities in joint preparation.

Deep penetration also permits smaller joint openings which are completed with fewer passes and savings in weld metal.

In fillet welds, the deep penetration greatly increases the fusion area. Design engineers, where permitted, can take advantage of the opportunity offered by the process to design smaller welds with strengths equal to larger welds with less penetration.

Flux-cored wire is fed continuously from coils. This saves the time required to change electrodes in manual metal-arc welding. As a result, arc time factor is greatly increased. Deposition rates range from 12 to 15-lb. per hour using 400 to 500 amp.

Robvon's Commercial Backing Rings are designed for quick easy alignment of pipe or tubing and assure precise close tolerance fit-up. Robvon Backing Rings allow complete penetration and fusion of the weld. Robvon Backing Rings radiograph perfect certified welds. The patented nubs automatically set the welding gap for the root-pass. The internal bevel and flat inner land assures non-restricted fluid flow.
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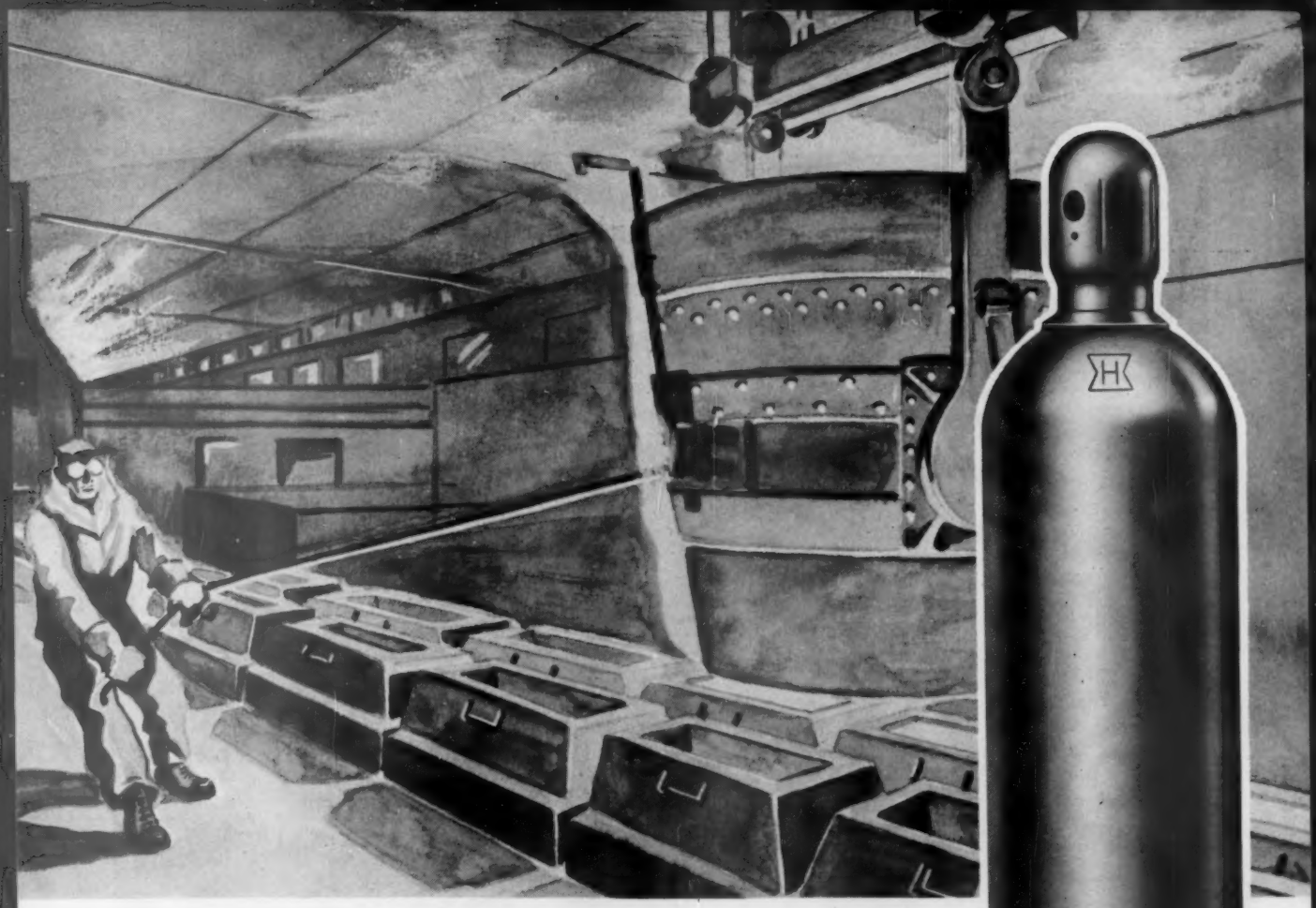

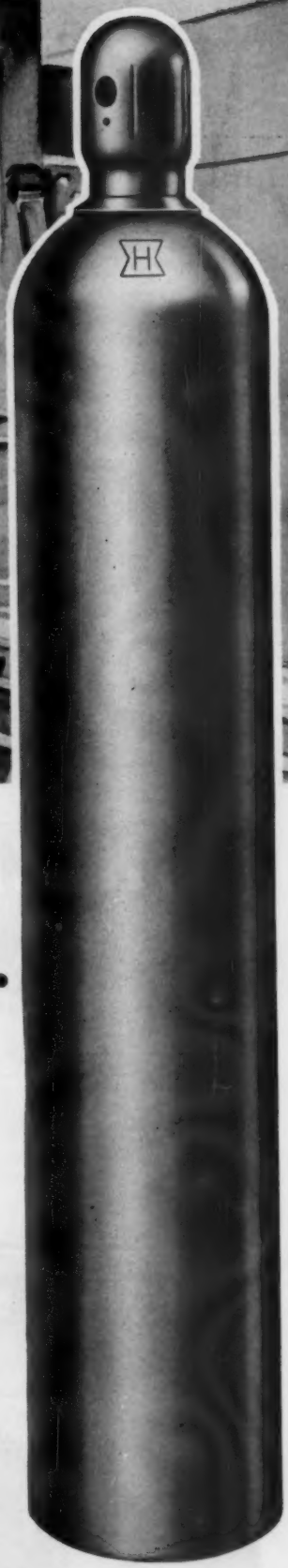

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PROSPECTIVE PURCHASERS OF GAS CYLINDERS may be interested to know that Harrisburg Steel produces for itself the major portion of the alloy and manganese steel required for its cylinder production.

These facilities make Harrisburg largely independent of outside sources of steel supply and provide great flexibility in the processing of orders, in the control of metal quality and in continuity of production.

If you are in the gas cylinder market (which you probably are if you read this ad) and you have a problem or a question or would like to buy gas cylinders write or call us.

HARRISBURG STEEL CO.

Division of HARSCO CORPORATION
HARRISBURG 8, PENNSYLVANIA

For more facts Circle No. 204 on Welding Info-Aid Card

Under heavy pressure . . .

Tig-welded aluminum eye makes big pull

UNDER HEAVY PRESSURE, a Tig-welded aluminum eye recently succeeded in a big pull of 10,000 ft of heavy-weight gas pressure cable for the Long Island Lighting Co.

Built to carry 69,000 volts, the cable includes a 4-in. ID copper core with a 180-mills-thick aluminum sheath and a Hi-Fax polyethelene covering between the two metals.

To install the $12-per-ft three-conductor 800 MCM cable, a pulling eye of 6061-T6 aluminum was manually Tig welded to the 1100 aluminum sheath. The eye was used to pull the cable from the reel to its final destination.

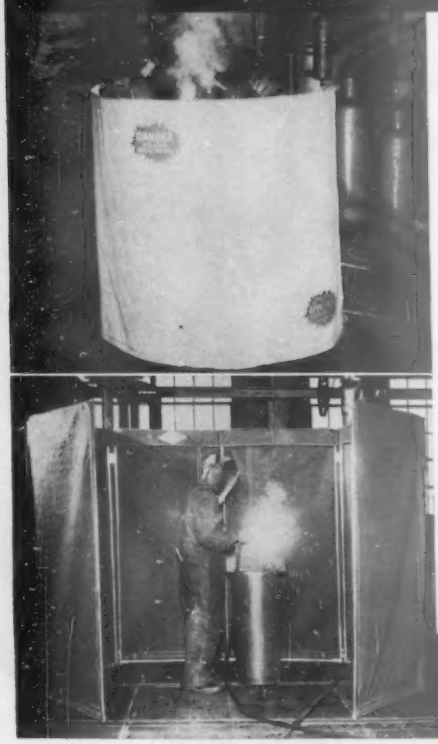
After preparation of the edge with a wire brush, 0.24-lb per weld of aluminum filler metal was deposited in two passes using 1/8-in.-diameter R-S5B filler rod.

Current setting for welding was 200 amp. The power source was a motor generator; and shielding medium was argon gas flowing at 35 cfm.

No post-weld treatment was necessary.

Welding was done by the producers of the cable, Phelps Dodge Copper Products Corp., New York City, at their Yonkers plant.

SHIELDING FOR SAFETY



SPA-FLA PORTABLE WRAP-AROUND SHIELD WITH BUILT-IN HANDY HANGER

ROLLS UP

The recognized standard in safety shields. SPA-FLA has a 14-gauge galvanized wire insert that permits it to be shaped around the job for maximum floor level protection. It's self standing, readily portable, rolls up compactly. Ideal for welding, cutting, grinding . . . wherever a quick, safe screen is required. "D" rings at all four corners for supporting on overhead operations. Select from 15-oz. UL Approved Duck, or the modern, Fire-resistant WELD-TEX vinyl-coated glass cloth fabric. Seven standard sizes from 18" x 30" to 72" x 108".

SAF-T-SCREEN ALL-PURPOSE SCREEN, ROOM DIVIDER, ENCLOSURE

FOLDS UP

Need a quick, inexpensive room partition, wind break, work shelter, or protective screen? Then here's your answer! Saf-T-Screen is a rugged, tubular Aluminum frame, sturdily hinged in multiple sections to form a self-standing, floor-level screen or partition with a hundred uses. It folds compactly, is easily carried. Fabrics include choice of UL Approved Duck, WELD-TEX vinyl-coated glass cloth, or RAY-FOIL for radiant heat protection. Panel sizes are 36" x 72" or 36" x 60". Casters are available. Special sizes can be custom-built to order.

Visit Our Booth No. 117
At New York Welding Show.

FROMMELT INDUSTRIES, INC.
Dubuque, Iowa
FABRICATORS OF APPROVED SAFETY PRODUCTS

No danger to these welds from hydrogen embrittlement. They're produced with Inco-Weld "A"; carbon steel flanges to stainless steel jacket, stainless steel jacket to Inconel* nickel-chromium alloy plate.

Inconel alloy to stainless steel to carbon steel ...Versatile Inco-Weld "A" Wire joins all 3

This retort is destined for brazing and bright annealing at working temperatures up to 2100°F in dry hydrogen atmosphere.

The welding problem was to obtain joints between three dissimilar metals: Inconel alloy, stainless steel, and carbon steel. These joints had to resist oxidation, resist cracking due to hydrogen embrittlement, and at the same time remain strong at high temperatures.

Rolock, Inc. of Fairfield, Connecticut, produced the desired welds with a *single* material, Inco-Weld "A"* wire. This wire, it has been demonstrated, will produce X-ray quality welds between 97% of all weldable dissimilar alloy combinations. What's more, the Inco-Weld "A" deposit matches (or betters) the heat and corrosion resistance of most parent metals. Other advantages include:

1. High tolerance for dilution of base metals without forming brittle or crack sensitive alloys.
2. Moderate coefficient of expansion.
3. Ability to withstand high service temperatures over long periods of time.

Inco-Weld "A" wire and electrodes are easy to use. No special equipment is required. Arcs are spray-type. Work seldom needs pre-heating.

Both wire and rod are available in standard diameters and forms, and conveniently packaged.

You can get further particulars on the use of Inco-Weld "A" in joining many dissimilar alloy combinations from our folder, "Now You Can Weld Dissimilar Alloys Quickly and Easily." If you don't have a copy, write:

*Inco trademark

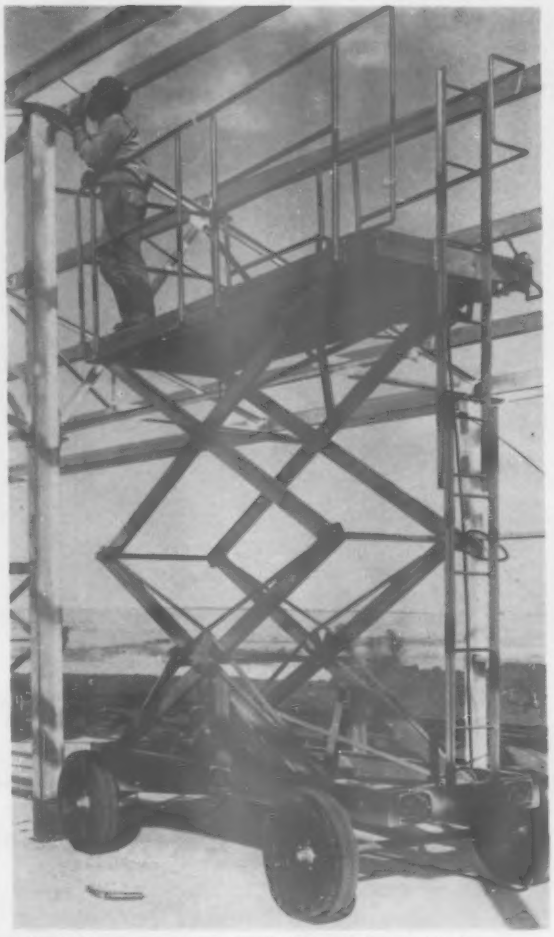
HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia

INCO WELDING PRODUCTS
TRADE MARK
electrodes · wire · fluxes

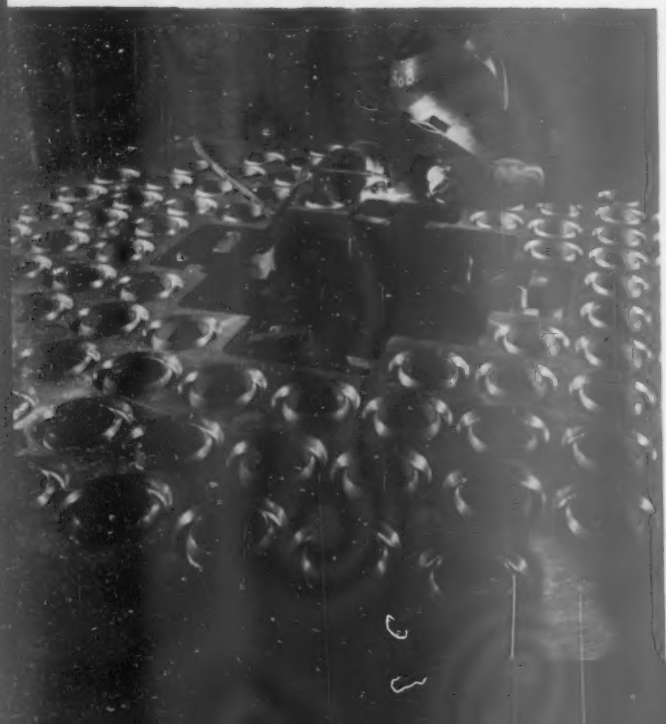
For more facts Circle No. 206 on Welding Info-Aid Card

On the job . . .

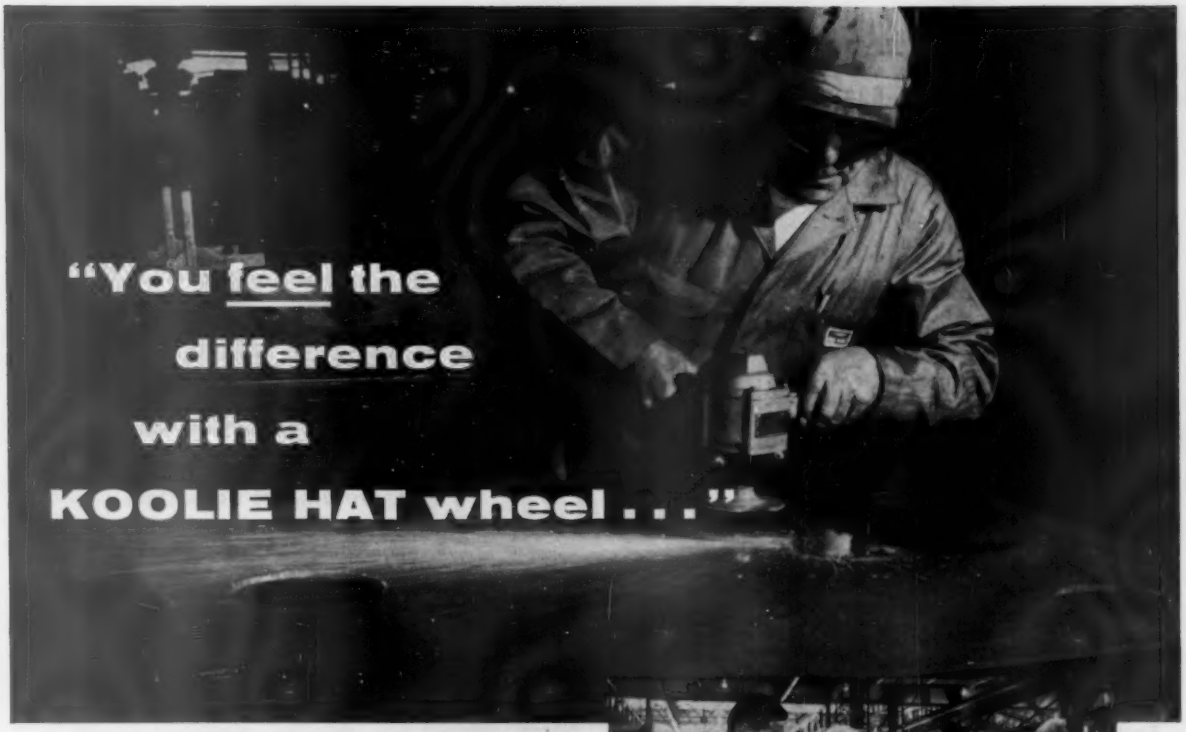
WEIGHING over 85 tons, this all-welded propylene storage and feed vessel was shipped from Bethlehem Steel Co., Bethlehem, Pa., to its destination in Delaware. One of six fabricated by the steel company, it is designed to operate at 300 psi and 250 F. Material is 1 5/32-in. steel plate. Tank, 100-ft long with 10-ft 6-in. inside diameter, is supported by two welded saddles permanently attached to the shell.



STANDING on a portable hydraulic lift made by The Charles Machine Works, Inc., Perry, Okla., welder joins wind braces on airplane hangar construction job.



STAINLESS steel inserts for positioning fuel element nozzles in a nuclear reactor grid plate are Tig welded at Allis Chalmers Mfg. Co., Milwaukee. Inserts are welded to top and bottom grid plate surface. Grooves are then filled with weld metal until flush with plate surface. Final machining cut finishes the surface.



"I can work almost half again as long without getting an ache in the wrist and arm muscles," says Walt Via (shown above grinding a Utility Trailer king-pin assembly).

"... even after a long stretch of grinding, I'm not tired. Its unusual shape makes grinding hard-to-get-at spots easy." That's what Operator Walter Via says about the Koolie Hat wheels he's been using at Utility Trailer Manufacturing Company, Los Angeles, one of the West Coast's biggest manufacturers of custom-built trailers.

Here's *why* Bay State's unique reinforced resinoid disc-wheel is the least fatiguing, fastest, safest wheel on the market:

Easier Operation "Koolie Hat" wheel is held at 4° to 5° angle instead of 25° to 30°, requires less pressure, virtually eliminates jitter and bounce.

Extra Safety "Koolie Hat" shape wears evenly over all three abrasive layers instead of one at a time. Less danger of shattering due to heat cracks or thinning of wheel.

More Uniform Speed Narrow radial contact surface between "Koolie Hat" wheel and surface keeps speed high for fast, efficient metal removal without heat build-up.

If you want to give your operators (*and* your profit curve) these advantages, get the full story from your Bay State distributor or direct factory representative. *Better grinding at lower cost, that is their business.*

Bay State representative Emil F. Rogers (left) shows the unique shape of the Koolie Hat wheel to Utility Trailer's Director of Purchasing, Virgil D. Waters (right) and Lead Operator Walter Via (center).

NEW U-grade formulation complements original "Koolie Hat" R-grade wheel, ensures extra-long life when grinding all materials with higher speed grinders operating at 5200 r.p.m. or above.

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVES

See KOOLIE HAT in Booth 501 at American Welding Society Exposition

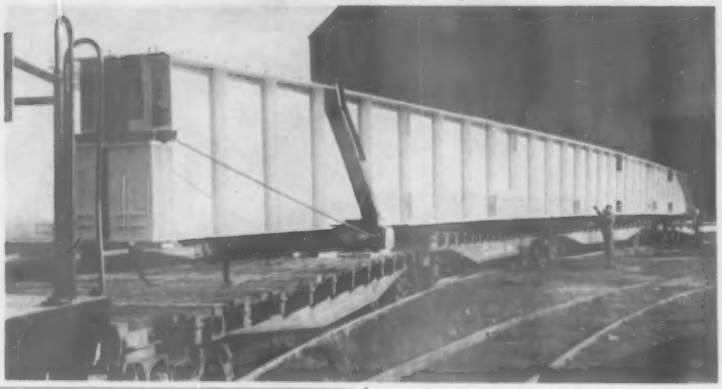
Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

For more facts Circle No. 207 on Welding Info-Aid Card

WE April Headlines

. . . from page 8

172-ft long expressway girder

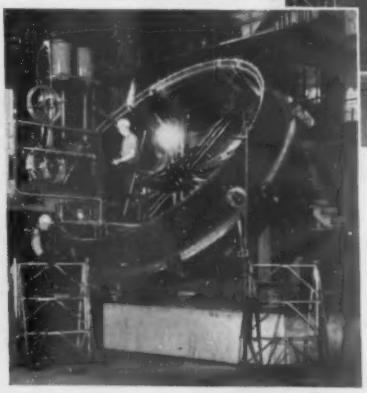


ONE of 12 172-ft-long all-welded girders fabricated for Little Rock, Ark.-North Little Rock Expressway is hauled from Gary, Ind., plant of U. S. Steel's American Bridge Division. Girder weighs 43 tons, required four flat cars for delivery.

PROFITS are built on DEPENDABILITY

ARONSON Model G3500 "EXCALIBUR" Gear Driven Positioner is used by a large Eastern steel producer for hard-facing bell hoppers for blast furnaces. "EXCALIBUR" provides the greatest precision and economy in the handling of large workpieces.

"EXCALIBUR" is not a special job machine, but a Positioner that will handle 90% of those jobs you now wrestle around the shop floor with profit eating cranes.



"Excalibur" opens production doors that are closed to your competitors. "Excalibur" has been designed to handle almost every kind of weldment up to 175 tons at lowest possible shop cost — with the dependability that profits are built on.

ARONSON BUILDS THE MOST COMPLETE LINE OF POSITIONERS
. . . WITH CAPACITIES RANGING FROM 25 POUNDS TO 600 TONS

Universal Balance® Positioners • Bench Turntable Positioners • Gear Driven Positioners
Headstock-Tailstock Positioners • TracTred® Turning Rolls • Turntables
Fully Automatic Positioners • Geared Elevation Positioners • Magnetic Welding Clamps

Write for detailed engineering data

Quality PRODUCTS by Aronson MACHINE COMPANY, INC.
ARCADE, NEW YORK

See our display in BOOTH 700 at the AWS Welding Show, New York Coliseum, April 18-19-20

Philco demonstrates welding of transistors

Visitors to the recent Institute of Radio Engineers in New York City saw the first public demonstration of transistor manufacture by resistance welding.

A working exhibit was set up by the Lansdale Div., Philco Corp., with a single-station automatic welder built by National Electric Welding Machines Co., Bay City, Mich.

NEMA to hold first western conference

The National Electrical Mfg.'s Association will hold its first western conference at The Biltmore Hotel, Los Angeles on June 8-9.

Arrangements will be under direction of co-chairmen A. Arval Morris, president of Electra Motors, Inc., and Raymond M. Waggoner, west coast vice president of Hubbard & Co.

Oxygen Producers

To the list of oxygen producers published in our special February issue devoted to that element, add:

Manitowoc Oxygen Corp., Manitowoc, Wis.; Northern Oxygen Corp., West Allis, Wis.; and Big Three Welding Supply Co., Fort Worth, Tex.

Delete Oklahoma Oxygen Co., and Trinity Oxygen Co., as they are now plants of Big Three Welding Supply Co.

Also delete Corpus Christi Oxygen Co., Houston Oxygen Co., and Sabine Oxygen Co., as they were absorbed by Big Three Welding Equipment Co., Houston.

the man in 304

The man in 304 is a Liquidweld man from helmet to heels: Liquidweld torches, Liquidweld regulators, Liquidweld accessories.

He points up the advantage to you of a good *single source of supply*—Liquid Carbonic. Welding and cutting equipment. Supplies. Industrial gases. And more than 100 distributing points throughout the United States and Canada.

Investigate. When you're at the AWS Exposition in New York, talk to a Liquid Carbonic representative. He'll be in Booth 304.

GD GENERAL DYNAMICS | L-C LIQUID CARBONIC

LIQUID CARBONIC
DIVISION OF **GENERAL DYNAMICS**
Dept. WE,135 South LaSalle Street, Chicago 3, Illinois
In Canada: Liquid Carbonic Canadian Corporation, Limited, 8375 Mayrand Street, Montreal 9, Quebec

For more facts Circle No. 209 on Welding Info-Aid Card

55-ton welded girder

THIS 127-ft 55-ton all-welded box girder is about to be lowered onto the foundation piers of the Oliver Street Bridge over the White River in Indianapolis. The girder, which forms the backbone of the bridge, was fabricated at Hetherington and Berner only 200 yards away. Welding was mainly submerged arc with equipment made by The Lincoln Electric Co., Cleveland.

Oak Ridge develops radiation device

Oak Ridge National Laboratory, operated by Union Carbide Corp. for the U.S. Atomic Energy Commission, has developed a new radiation protection instrument.

The device is about the size of a fountain pen and weighs only 3½ ounces. Worn in a pocket, the instrument emits a warning tone and flashes a small neon lamp in the presence of a gamma radiation field.

Production begins at new piping plant

A new $4 million manufacturing plant of the Power Piping Div. of The M. W. Kellogg Co., a subsidiary of Pullman Inc., Williamsport, Pa. is now in production.

The new facilities include completely-equipped metallurgical and welding laboratories, and a modern, one-story office building.

Manufacturing stations in the 900 ft by 155 ft plant include cutting, bending, machining, welding, heat treating, radiographic inspection, and shipping.

DURO ELECTRODE HOLDERS

THE DURO "STANDARD"

* Featuring "Long Jaw Design" for reaching hard to get at places.
* Cool operation-cool handling.
* Insulated handle and guard protects the operator.
* All parts easily replaced.

THE "ADJUSTABLE TENSION"

* Easy adjusting of Spring Tension for your requirements.
* New type cable connection prevents fraying of cable.
* Aluminum model weighs only 13 oz.
* All parts replaceable including copper alloy jaw.

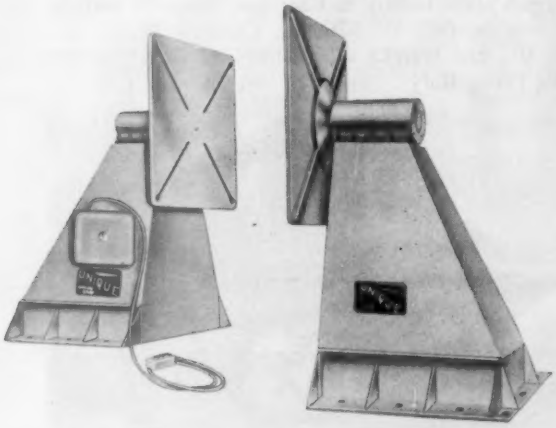
For further information write:

THE DURO MANUFACTURING COMPANY

71 Oregon Avenue, Hamden 17, Connecticut

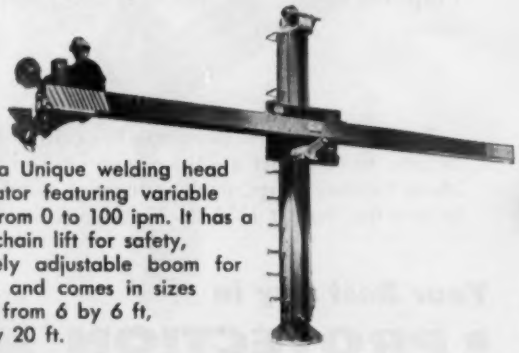
The Most Complete Line of Welding Positioning Equipment

By using Unique equipment you can slash your welding costs in half, reduce handling of work, yet increase your welding production and perfection.

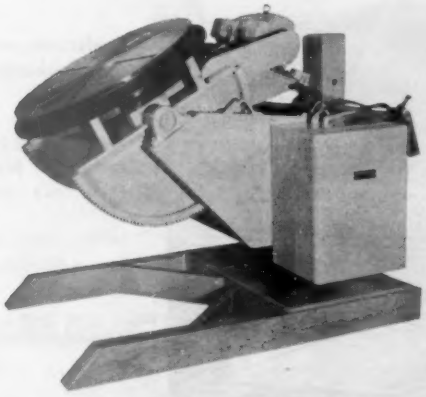


These head and tailstocks will provide you with variable or constant speeds, and can handle from 1,000 to 200,000 lb.

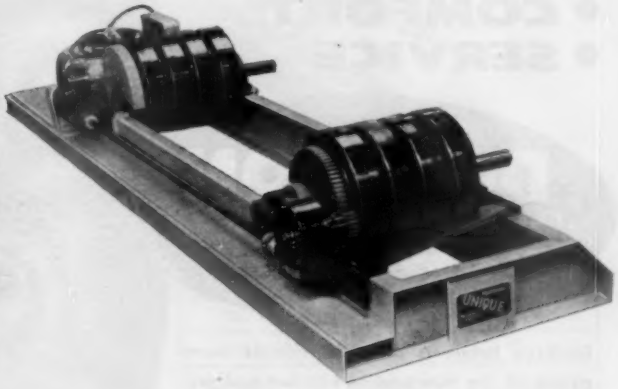
This new boom carriage positioner allows for longitudinal welding as well as the circumferential welds. The welding head tip is in perfect alignment with the center of the positioner. This boom carriage feature can be adapted to any UNIQUE positioners.



Here is a Unique welding head manipulator featuring variable speeds from 0 to 100 ipm. It has a double chain lift for safety, completely adjustable boom for leveling, and comes in sizes ranging from 6 by 6 ft, to 24 by 20 ft.



Welding positioners, when combined with other Unique equipment, will make your weldor a one-man production line — with push-button accuracy all the way. These precision gear-driven positioners are available in models ranging in capacity from 250 lb to 100 tons.



These turning rolls and idlers are portable and require little maintenance. It can handle jobs from 3,000 lb to 200 tons.

VISIT OUR BOOTH 514
A.W.S. WELDING SHOW
NEW YORK COLISEUM
APRIL 18, 19, 20, 1961

ASK US ABOUT OUR LEASE PURCHASE PLAN

Unique Equipment, Inc.

Exclusive designers of positioning equipment

122 SUMPTER STREET BROOKLYN 33, NEW YORK

For more facts Circle No. 211 on Welding Info-Aid Card

In Summary . . .

The present research division of **Sciaky Bros., Inc.**, in Los Angeles will be transferred to the recently enlarged plant facility in Chicago. Research and development inquiries should be sent to 4915 W. 67th St., Chicago 38, Ill. . . . **Thor Power Tool Co.**, Aurora, Ill., has bought sole control of Italy's largest manufacturer of air tools, **FIAP**, Turin, Italy . . .

The biggest filter ever built for the coal mining industry (see cut) will be installed at the Clinchfield Coal Co., Russel County, Va. The 27-ft-long welded filter was fabricated in Salt Lake City by **Graver Tank & Mfg. Co.** . . . **Cerro De Pasco Corp.** has deleted "De Pasco" from its corporate name . . .

Technical services provided by **British Oxygen Canada Ltd.**, Toronto, are helping to construct a jet aeroquay at Toronto International Airport . . . **Klemp Metal Grating Corp.**, manufacturer of metal gratings, is moving several divisions to new quarters at 1132 W. Blackhawk St., Chicago 22, Ill. . . .

Your Best Buy in

- **PROTECTION**
- **COMFORT**
- **SERVICE**

DOCKSON HELMETS

Comfortable, molded-fiber, quick-adjusting headgear.

Special spring pivot holds at any position, allows easy tip-up.

Lift-front holds Federal Spec. welding and cover lenses.

Adjustable headgear stop.

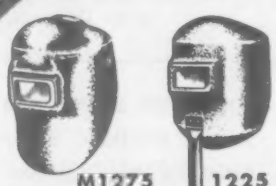
Clear lens for chipping or inspection.

Husky, one-piece, heavy gauge fibre glass or fibre, molded shell; heat, moisture, warp-proof.

1450

Dockson helments and handshields incorporate all the outstanding comfort and protection features so important in safety equipment today. Quality built for long service life, they are roomy, sturdy, lightweight, and fully adjustable for complete protection against sparks, flash, and dangerous arc welding rays.

Write for complete Safety Equipment Catalog



M1275 1225

Built for Better Service

Dockson CORPORATION

3939 WABASH AVE • DETROIT 8, MICHIGAN

HI-AMP Economy Series
ELECTRODE HOLDERS

YOUR CHOICE OF ABOVE MODELS

With a model to serve every manual arc welding purpose. Tong members made from high copper alloy with ample cross-section to handle rated currents.

This "M" series of electrode holders is made to forget about maintenance problems. Buy them, make proper connections to your cable and obtain long, durable life. Instead of spending time and money on repairs, replace with new holders after many hours of good, cool running service.

Pick the size required for your plant operations and order the ones you need, today.

Model No.	Amperage	Cable size	Electrode size	Weight
M-100	100	#1	1/8"	10 ounces
M-200	200	1/0	5/32"	11 ounces
M-300	300	1/0 & 2/0	1/4"	19 ounces
M-350	350	1/0 & 2/0	5/16"	21 ounces
M-500	500	3/0 & 4/0	3/8"	27 ounces

Manufactured By

LENCO, INC.

350 W. ADAMS ST. JACKSON, MISSOURI

SOLD THROUGH LEADING WELDING SUPPLY HOUSES

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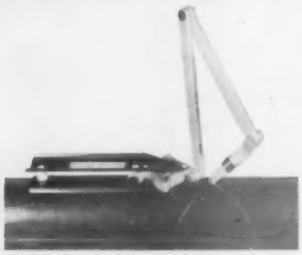
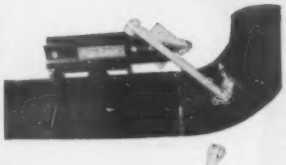
CURV-O-MARK

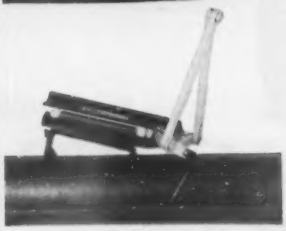
Contour Marker



Marks off any pipe joint or structural angle cut accurately, easily and without figuring cutbacks. Contour Markers mark all around pipe — save both time and gas. Available in 2 sizes of 1½" to 18" in cross-section, 16" to 48" diameter.

Combination Adaptor



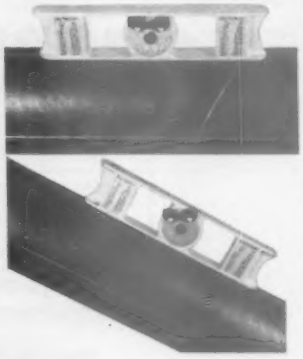


FOR CONTOUR MARKER

Adaptor allows layman to use all sides of Contour Marker in layouts on pipe and structural steel. Standard model marks up to 30" pipe, without having to quarter or halve. Marks over surface irregularities and old welds, and without having to break wrap so far back on wrapped pipe. Compound angles can be marked in one setting of tool; also, any portion of tube turns or 90°. The combination adaptor also furnished for the Jumbo Marker on special order.

Pro-Mag-Level

Pocket size and equipped with two magnets on each plane for holding level in position. One side is machined flat for flat work, and the other, to a slight V-plane for pipe. Besides level, Pro-Mag-Level is equipped with 90° dial marked in 2½° increments and scales for rise in degree per foot or meter. Frame made of strong cast aluminum.



CONTOUR SALES CORPORATION

1843 E. Compton Boulevard Compton, California

SEE US AT BOOTH 227 AWS SHOW, NEW YORK COLISEUM

Reprints still available from WE

Reprints of certain articles published in Welding Engineer are still available. A list of these appears below. Reprints may be obtained for 15 cents each, except where otherwise noted. Payment must accompany all orders. For quantity orders, write for special prices. Order by title from: Reprint Editor, Welding Engineer Publications, Inc. Box 28, Morton Grove, Ill.

Fundamentals of wear resistant overlay

Explains causes of metal deterioration and how to avoid it and how to select a welding process for hardfacing. This reprint 25¢ each.

Techniques for torch brazing aluminum

Procedures and techniques for brazing aluminum, are detailed. Includes data sheet on brazability of aluminum alloys plus four tables listing commercial products and their characteristics. This reprint is free.

Design for welding

Basic knowledge required when designing or redesigning for welded construction is detailed and discussed. Sixteen page reprint includes 11 data sheets.

The meaning of weldability

Weldability of carbon steels and alloy steels, as well as some other metals, is discussed. Sixteen page reprint includes three data sheets.

How to weld T-1 steel

Explains how to weld this high-strength low-alloy metal. Includes a data sheet on T-1 mechanical properties.

Fundamentals of oxyacetylene welding

Gives the basic essentials on and primary steps of oxyacetylene welding.

Welding of dissimilar metals

Complete details on welding dissimilar metals using NiCrFe electrodes and wires. Eight page reprint includes charts on properties test results and data sheet on properties of other metals.

Acetylene

A 12 page salute to the IAA and acetylene, details the great success of this gas. Includes a history of the IAA and "The Acetylene Journal."

Fixtures for brazing

Presents requirements for designing brazing fixtures and materials to be used. Data sheet on properties of non-metallic fixture materials included. Free.

Filler metals for brazing

Brazing filler metals are detailed and each group is analyzed. Includes data sheet on how to select silver brazing alloys.

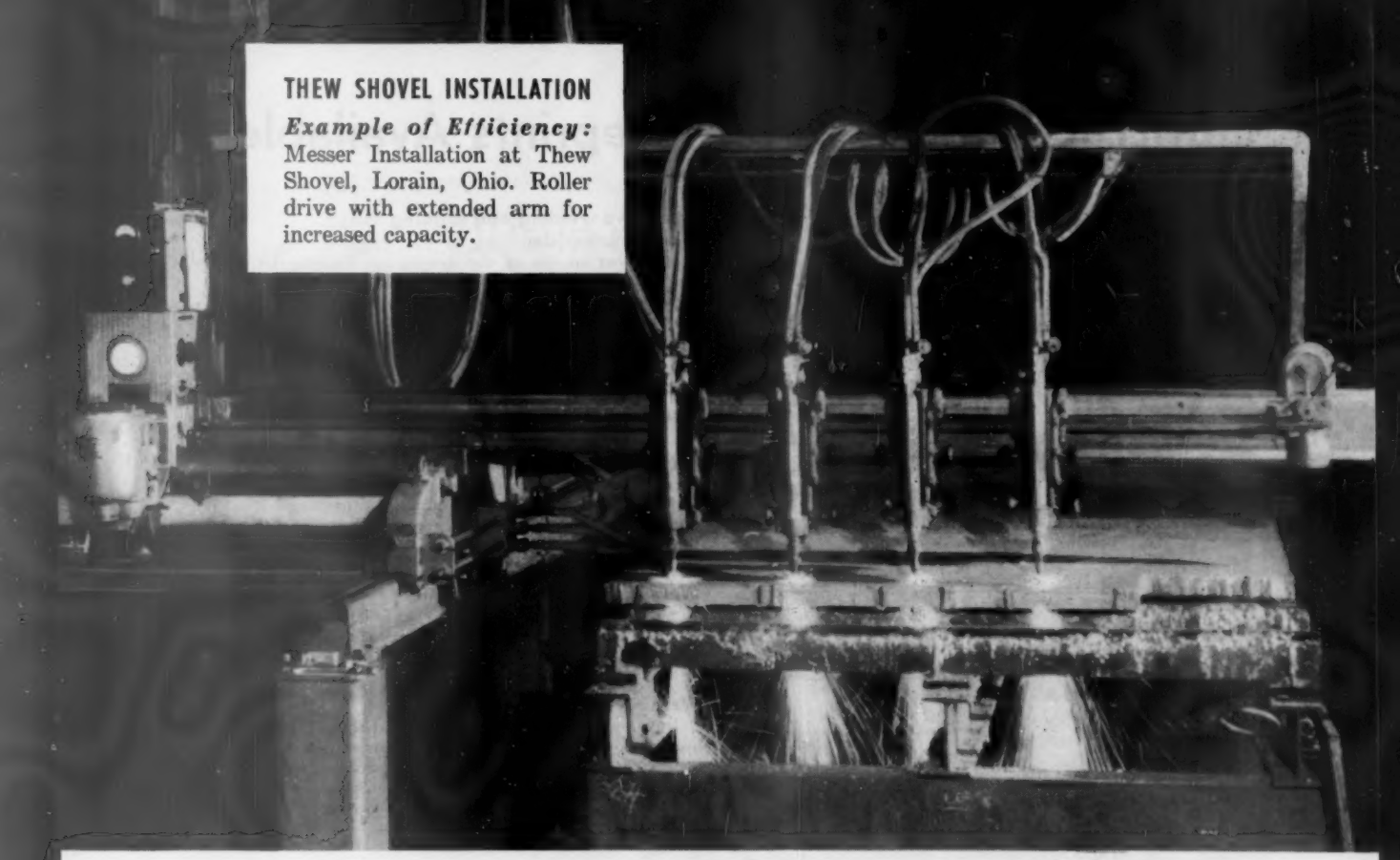
Production welding controls

Discusses how material, labor and overhead effect total production welding costs, and how certain controls can result in greater time and dollar savings. This reprint is free.

New aluminum alloy not prone to brittle fracture

Extensive testing of 5083 aluminum alloy proves it has excellent weldability and weld ductility, and a good resistance to corrosion and stress corrosion. Testing for brittleness is detailed. This reprint free.

(*Continued on page* 110)



THEW SHOVEL INSTALLATION

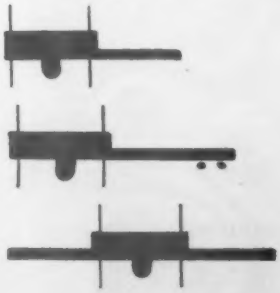
Example of Efficiency: Messer Installation at Thew Shovel, Lorain, Ohio. Roller drive with extended arm for increased capacity.

Whatever YOUR Needs... Only

MESSER

Offers You a COMPLETE Line of Flame-cutting Machines

STATOSEC—Sizes: 48", 60", 80", 100", 120". Available in either conventional or roller drive with choice of these designs.



STANDARD
(cutting capacity equal to width)

EXTENDED ARM
(cutting capacity 20" or 40" greater than width)

DUAL ARM
(cutting capacity double the width)

SICOSEC—Moderately priced, fully electronic drive. Sizes up to 144". Available in standard, extended, or dual arm.

SICOMAT—The incomparable sine-cosine drive machine for shipbuilding and heavy industry.

PORTAL—The precision flame planer of phenomenal accuracy widths from 100" to 240" for straight cuts or triple bevel. Edge preparation equal to machining at reduced cost.

Visit Messer Booth 504 at American Welding Show

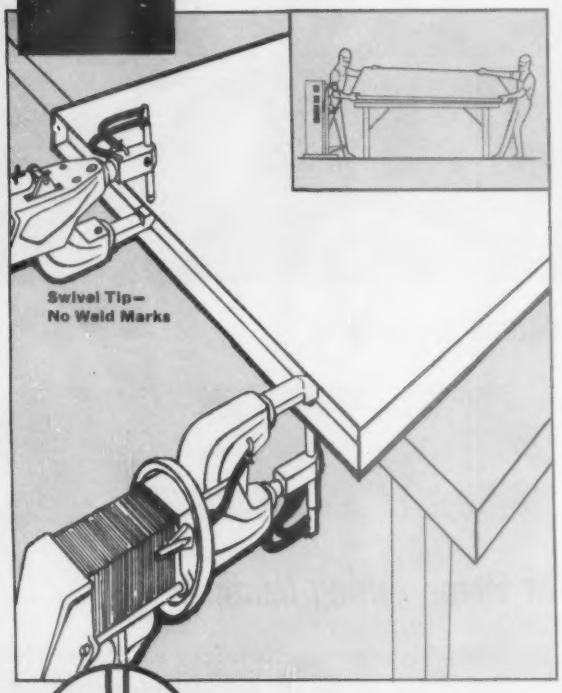
CUTTING MACHINE DIVISION

AMERICAN MESSER CORPORATION, 405 LEXINGTON AVE., NEW YORK 17, N. Y.

For more facts Circle No. 215 on Welding Info-Aid Card

UNWIELDLY ASSEMBLIES?

HERE'S HOW STEEL DOOR MANUFACTURER SLASHES LABOR 50%



ARO **#407** PORTABLE SPOT WELDER

Manipulating 1 steel door formerly required 2 or 3 men. Now, using ARO PORTABLE SPOT WELDER one man does the job . . . in less time too.

A Wide Variety of Models for Every Job.
Illustrated Literature on Request

ARO SPOT WELDER CORP.
66-10 Woodside Ave., Woodside 77, N. Y.
IL 8-4141

Reprints Available

(*Continued from page* 108)

Explosive welding and forming open another door

A report on one of the newest entries into the welding industry, and how one pioneer company turned theories and practices into realities.

Our modern-day mythology

A rebuttal to some old-wives tales about the hazards of welding fumes, plus safety recommendations for situations where hazards might develop.

Welding the reactive metals

This 12-page reprint describes techniques for Tig welding titanium, zirconium and tantalum. It also gives experimental data on resistance spot welding of tantalum.

Welding 17-4 PH stainless steel

Sound joints can be easily produced in 17-4 PH stainless by proper welding practice. This 4-page reprint details all phases of the procedure.

Welding thoriated magnesium

Development of specialized machinery and techniques for joining new magnesium alloys, especially thoriated types, has aided in the production welding of such materials. This 4-page reprint includes tables on mechanical properties and on weld defects and how they affect weld strength.

Instructions for welding moly

Molybdenum has a melting point of 4,730 F, which makes it ideal for high-temperature service in planes, missiles and nuclear reactors. This report gives welding data resulting from six years of experimental work sponsored by the Office of Naval Research. This reprint free.

Effect of arsenic on welds

A study of arsenic's effects on the mechanical properties of welds in mild steel was directed specifically toward a determination of arsenic's role in behavior of welding fittings. Results are revealed in this 4-page reprint.

Stress relieving

Stress relieving can be an important manufacturing operation or a needless expense item. This 4-page reprint is intended to help you in making a correct decision in the matter.

Uses of build-up electrodes

As rebuilding and reclaiming of worn steel parts becomes standard maintenance procedure, build-up electrodes increase in importance. This 2-page reprint lists the qualities necessary for a good build-up material.

A guide to preheat

This 4-page reprint on benefits of preheat includes an engineering data sheet entitled "Recommended preheat for steel alloys."

Non-destructive testing

Four separate articles comprise this 8-page reprint on non-destructive testing: how to interpret radiographs; circumstances and job requirements govern selection of radiation source in inspection; ultrasonic testing; and a program for radiation safety.

VIPs in review . . .

J. P. Casalis, Jr. has been appointed district manager of Air Reduction Sales Co.'s St. Louis district and *W. J. Gilliford* has been appointed assistant manager of distributor sales in the Philadelphia district.

A. F. Boucher has been named general sales manager by The Lincoln Electric Co., Cleveland. He advances to his new position from assistant general sales manager.

Austin F. Leach has been appointed manager for product planning and market research at Omark Industries, Inc., Portland, Ore. Leach was formerly sales manager for Omark's stud welding equipment.

Crucible Steel Co. of America, Pittsburgh, has appointed *G. W. Snyder* assistant to the commercial vice president and director of production control.

In a major realignment of its headquarters staff, American Society for Metals has appointed *Ernest E. Thum, A. P. Ford* and *Albert L. Lloyd* to positions as staff directors.

Robert M. Nalder has been appointed technical director of the plasma systems division of Schori Process Corp., Port Washington, N. Y. The division provides contract spraying of high temperature and wear resistant materials.

A. R. Schneller has been named manager of a new A. O. Smith Corp., Milwaukee, welding products division district sales headquarters in Newark, Calif.

Schneller

Rincker

Ansco Division of General Aniline & Film Corp., Binghamton, N. Y., has given *Norbert F. Rincker,* manager of X-ray sales, additional responsibilities for planning and sales of all X-ray products.

Allen Ellis Rosenberg has been appointed operations manager for the components division of Epsco, Inc., Cambridge, Mass. Epsco has also added *William H. Schetter* to the systems division and appointed *Richard Ferrero* product manager for instrumentation systems and portable data acquisition systems.

WEBB

TANK PRODUCTION MACHINERY

Horn Jigs
Offsetters
Seam Welders
Turning Rolls
Track Supports
Assembly Presses

Model M-2 with rotating turntable for reversing ends when both ends are to have offset flanges.

Complete catalog on any type or size machine furnished on request.

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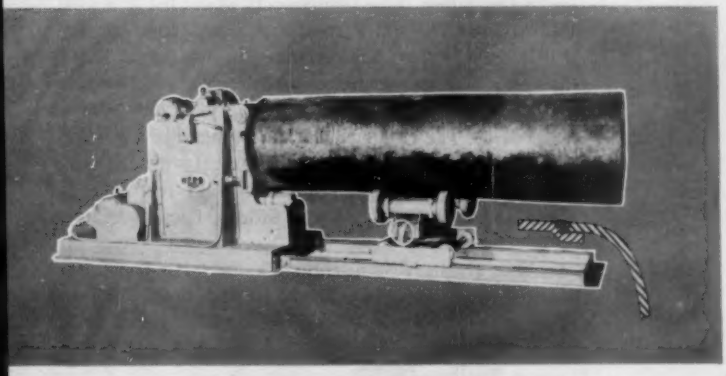
REED EQUIPMENT DIVISION
WEBB CITY, MO. U.S.A.

WEBB OFFSETTER

for forming an offset flange around shell ends to facilitate automatic welding of tank heads.

- Eliminates chill rings
- Improves concentricity of shell ends
- Shortens fit-up time
- Helps reduce welding time

Available in four models to handle up to ½" plate.
With standard dies.
New M 2-P pipe duty 6" to 30" up to ¼" thick.



WEBB ASSEMBLY PRESS

Companion fixture for assembling heads to shells — shells to shells.
• 25 tons closing pressure • Built-in fit-up rolls • Built-in kick-out lift • Adjustable for tank diameter and length
3 standard sizes to handle up to 72" diameter
Combination Assembly and Girth Welding Machines also available.

"Four Nines"
make $99.99 equal $134.94!

That's right—buy the whole package and you save $34.95! This is a complete "Purox" welding and cutting outfit that you can amortize in just a few jobs.

Sold separately, these components would list at a total price of $134.94—still a good buy, considering the top quality that "Purox" stands for. But with this "Four Nines" kit, you get a complete outfit for welding, cutting, heating, and brazing . . . all first-quality materials at a budget price. The "Four Nines" Outfit includes a welding torch with three heads, cutting attachment with one nozzle, oxygen and acetylene regulators, 12½ feet each of oxygen and acetylene hose with fittings, friction lighter, and goggles.

See it at your LINDE distributor's. Or, write for literature to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

"Linde," "Purox," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

Wasserman

Barr

Leonard C. Barr has been elected president of Eutectic Welding Alloys Corp., Flushing, N. Y. *Rene D. Wasserman,* founder of the firm, has been elected chairman of the board of directors.

In another change at Eutectic, *William C. Joerger* has been named district manager in the South Niagara Frontier of New York. He was previously technical representative in this area.

F. N. Zabriskie has been named assistant manager of sales in the midwestern region for Air Reduction Sales Co., New York City.

Postlewait

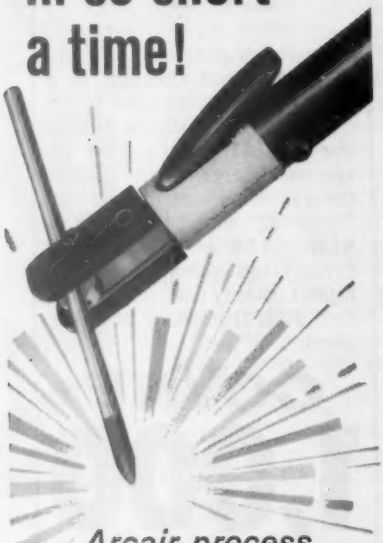
Evleth

George R. Postlewait has been appointed western regional manager for the RegO Plant Equipment Division of The Bastian-Blessing Co. in Arizona, California, Nevada, Oregon, Washington and western Idaho. He is replacing *Earl M. Evleth* who has retired.

The Fibre-Metal Products Co., Chester, Pa., has named *Donald R. Burke* as acting comptroller.

New assignments for four contracting engineers have been made by Chicago Bridge & Iron Co., Chicago. *Arthur G. Albertson* and *William T. Livings* have been transferred to the New Orleans sales district, *Harry E. Douglass, Jr.* to Cleveland and *Stanley V. Whitehead* to Kansas City, Mo.

No other tool saves you so much money in so short a time!



Arcair process for metal removal

The Arcair Torch moves metal. Faster, better, cheaper than any other tool or process. Cuts, gouges, bevels any metal. Under almost any conditions.

ARCAIR PROCESS—The Arcair Torch uses current from your welding machine and special electrodes to melt metal. Ordinary shop air through the Arcair Torch blows away the molten metal. Job is finished, amazingly fast, clean.

SAVES MONEY—The Arcair Process moves metal four, eight, ten times faster. Saves minutes, hours. Eliminates costly finishing equipment. Your men learn to operate the Arcair Torch in 15 minutes. Complete range of hand and automatic torches. There's one that will save you money.

NEED PROOF?—Write us your specific problem. We'll show you how the Arcair Process can save *you* money—fast.

Arcair®

Bremerton, Washington
Lancaster, Ohio

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C. E. Davis, Jr., is general sales manager of Marks Oxygen Co., Inc., Atlanta, Ga. Marks, who has been in the welding industry for over 26 years, was formerly with Metal & Thermit Corp., in Pittsburgh and Atlanta.

Davis

Stuart

Warren Stuart has been appointed sales manager of the Belden Mfg. Co., Chicago. Stuart has been with Belden 15 years.

James M. Straub, president of Fort Pitt Bridge Works, Pittsburgh, was elected president of the American Institute of Steel Construction at its 38th annual convention.

North American Philips Co., Inc., Lewiston, Me., has appointed *Jan Bleeksma* vice president in charge of manufacturing at its wholly-owned subsidiary, Amperex Electronic Corp., Hicksville, N. Y.

Alan Wood Steel Co., Conshohocken, Pa., has promoted *J. Frederic Land* to assistant vice president of marketing. The firm has also appointed *William T. Haddon* general manager of steel sales and *George G. Karian* general manager of a new iron powder division.

Dr. O. G. Lellep, engineering consultant to Allis-Chalmers Mfg. Co., Milwaukee, has been awarded the Carl Lueg Memorial Medal by the German Society of Iron and Steel Engineers in recognition of his pioneering work in applying oxygen to the production of steel.

John F. Spaulding, president of Skil Corp., Chicago, has also become chief executive officer of the firm as a result of a change in the corporate by-laws approved by the board of directors.

Philips Electronic Instruments, Mt. Vernon, N. Y., has appointed *E. J. O'Rourke* New York branch manager. O'Rourke was formerly senior sales engineer in the New York office.

BUSINESS PARTNER

—your LINDE distributor!

In the business of welding, you'll find a capable partner in your LINDE distributor. He is ready and equipped to give you the fast, efficient, personal service you need. He maintains complete stocks of welding and cutting equipment and gases, welding rods, supplies, and accessories. And since it's his business to help your business, he concentrates on knowing what you want—and having it ready.

More than this, your LINDE distributor is an independent local businessman, familiar with nearby industry and its welding needs. When these needs include expert advice, he's prepared on that score, too. He can also call on LINDE's own technological services for the answers to new, different, or difficult welding problems. More than fifty years of pioneering in welding and cutting stand behind the LINDE brand name; through your LINDE distributor, this background is available to you.

A phone call is all it takes to get in touch with this valuable business partner. Look him up in the classified directory. Or, write for his address to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada*, Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

Your LINDE Distributor

"Where One Call Gets It All"

LINDE COMPANY UNION CARBIDE

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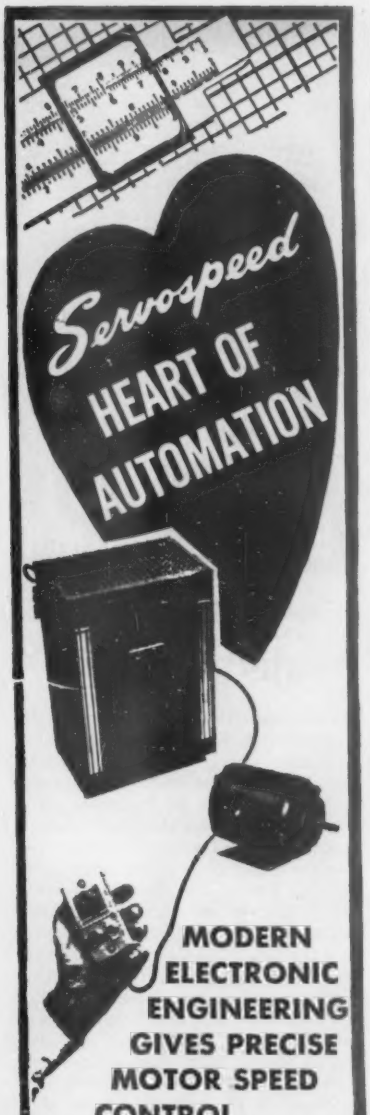

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1/100 — 10 H. P.

Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in DC motors while operated from the regular alternating current power line. Grid controlled "Thyratron" tubes are utilized for power controlled stepless variation to supply motor armature power. Patented feedback, or "Servo" circuits provide constant torque capability over wide speed ranges of as high as 60 to 1 in some models and a minimum of 20 to 1 in others.

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DIV. of ELECTRO DEVICES, Inc.
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Bill Johnson and *E. C. Sanford* have been appointed sales representatives for Car-Mon Products Co., Chicago. Johnson will cover western Pennsylvania and Sanford will cover California and Nevada.

British Oxygen Canada, Ltd., Toronto, has appointed *James Barr* manager of technical services. He has been with the firm for 8 years and has a 25-year welding background in his native Scotland.

Herbert E. Brumder has been elected president of Pressed Steel Tank Co., Milwaukee. In other moves, the board elected *Herman Merker,* president since 1950, to the position of chairman of the board; and *W. L. Killen,* vice president of manufacturing and engineering.

Brumder

Morrison

Metalock International, Inc., Long Island City, N. Y., has appointed *R. C. Morrison* vice president and general manager. Morrison was formerly president and general manager of United Specialties, Inc.

J. S. Smart, Jr. general sales manager, American Smelting and Refining Co., New York City, has been elected president of The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

Raymond G. Sloan, Jr. has been appointed manager of magnetic steel products for Armco Steel Corp., Middletown, Ohio, replacing *William Jones* who is retiring after 42 years with the firm.

Henry Schrimpf has been appointed engineering application manager for the systems division of Epsco, Inc., Cambridge, Mass.

Frederick G. Jaicks has been named vice president of Inland Steel Co., Chicago. Jaicks has been general manager since January, 1959.

BIG BIG

The curtain's going up, April 18-20 in the New York Coliseum, on a brand new era of increased profits from the sale of acetylene gas. It's the **BIGGEST** profit-making advancement since Coyne Cylinder Company first introduced the Coyne "92" high-porosity filler. **NOW . . . FOR ANOTHER FIRST** Coyne brings you the industry's highest porosity filler in the industry's **BIGGEST** capacity acetylene cylinder.

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Connor

Rowen

Thurlow

Cork

Miller Electric Mfg. Co. makes 8 new appointments

Miller Electric Mfg. Co., Appleton, Wis., has made eight new appointments.

E. W. "Gene" Conner has been made regional sales manager for Washington, Oregon, California, Idaho, Arizona, Utah, Nevada and Montana. *D. K. "Don" Rowan* has been appointed district sales manager under Connor. Rowen will cover Southern California, Arizona and southern Nevada. *A. H. "Turk" Thurlow* will be district sales manager for Washington, Oregon, Idaho and Montana, under Connor.

R. W. "Ron" Cork has been named sales representative for Minnesota, North and South Dakota and part of Iowa, and *D. G. "Glen" Fike* has been appointed sales representative in the southeast.

Fred M. Sullivan has been named technical representative in the Miller laboratory and *Clarence M. Weiseckel* has been appointed assistant to the president in charge of plant operations.

Heading the recently organized cost analysis department is *Margaret M. Harrant*, assistant to the president.

Fike

Sullivan

Weiseckel

Harrant

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Remove Welding Fumes

STEP UP EFFICIENCY

Keep shop clean. Improve operators' production efficiency. Wherever there's smoke or fumes, — up, over or into your work — this Exhauster quickly and safely gets rid of them.

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35 years of experience in the manufacture of welding equipment and rods

Visit our exhibition at the AWS Welding Show, New York Coliseum, April 18, 19, 20 Booth 203

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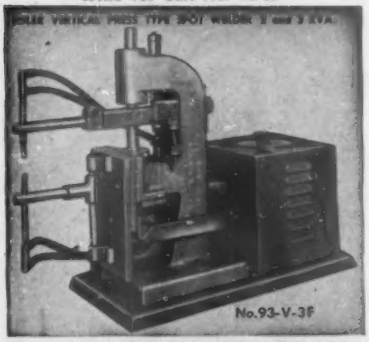
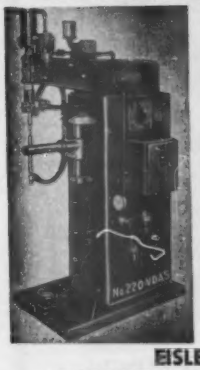
EISLER VERTICAL TYPE PRESS WELDERS

We also make a complete line of Spot and Wire Butt Welders.

Write for Cat. No. 93-57





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Charles Eisler Jr., President

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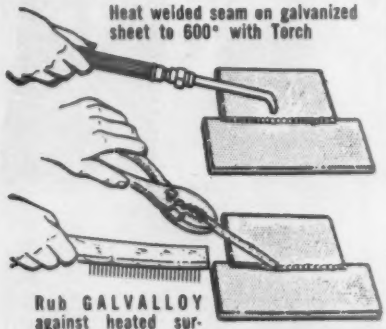
No Other Product Can Do a Galvanizing Job Like

Galvalloy

Does - *HERE'S PROOF*

Heat welded seam on galvanized sheet to 600° with Torch



Rub GALVALLOY against heated surface as shown — now spread with wire brush for a bright finish.

GALVALLOY Covers the Same Amount of Area with 1/5 the Amount of Material.

Send today for Testing Sample and you'll learn Why GALVALLOY has no equal for ANY Galvanizing Job.

METALLOY PRODUCTS CO.

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Circle No. 225 on Info-Aid Card

In retrospect

(Taken from **Welding Engineer** issues of April, 1916, 1931, and 1946)

—45 Years Ago—

Oxyacetylene welding . . . itself in its earliest stages . . . is the latest work to attract female labor in England. Even before the war, there was not an abundance of men doing this work, for the temptation with them when they had attained proficiency was to go on to the still better paid labor of cutting metal with oxygen.

Spot and butt welding processes have completely upset the filing cabinet business. A few years ago, wood cabinets had the call, but since the introduction of welding processes, steel cabinets have been gaining in favor.

—30 Years Ago—

Among the speakers at the Fifth Annual Welding Conference at North Texas Agricultural College, Arlington, Texas, this month will be L. C. Monroe, a member of the WELDING ENGINEER staff.

W. D. Flannery has established Harris Calorific Sales Co. at 136 Liberty St., New York City, for the purpose of distributing Harris products in the New York metropolitan area. At the same time, it was announced that E. N. Stevens was made assistant sales manager of the Cleveland firm.

—15 Years Ago—

Weldit, Inc., Detroit, is building a new factory located on Oakman Blvd. in that city. Construction is expected to be completed about June 1.

P. J. Patton, Jr., formerly with A. O. Smith Corp., was recently appointed midwest regional manager by the industrial division, Ransome Machinery Co., Dunellen, N. J., subsidiary of Worthington Pump and Machinery Corp.

The Emerson Electric Mfg. Co. is moving all manufacturing and office facilities from its downtown buildings to a new $5 million plant located at 8100 Florissant Ave., St. Louis.

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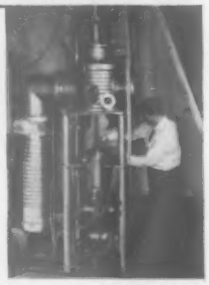
NEWS from the NRC Vacuum MICRONICLE*

PURER METALS WITH ELECTRON BEAM



Hard to melt materials such as tungsten, tantalum, zirconium, molybdenum, columbium and other high performance metals can now be melted without contamination. Electron beam technique can be used for either melting or contamination-free welding.

These furnaces can operate at highest vacuums attainable in a furnace and melt stock in any form. Melting temperature is almost unlimited. Heating can be concentrated or spread out as desired.

*FREE. Contains news about improving products with NRC High Vacuum Equipment. Write on firm letterhead. Dept. 85-D 160 Charlemont St., Newton 61, Massachusetts.

NRC EQUIPMENT CORPORATION

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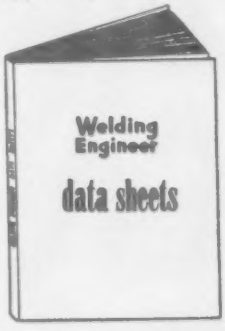

This cross-indexed volume contains 134 of the best Data Sheets appearing in WELDING ENGINEER in the past 20 years. Yet it costs only $1.60.

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Book reviews...

Welding techniques

NEW DEVELOPMENTS IN THE WELDING OF METALS. By P. J. Rieppe. Published by Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C., 1961, 50 pages. Price $1.25.

The advantages and shortcomings of 14 welding techniques developed since 1956 are surveyed under four categories: fusion welding, resistance welding, high-temperature brazing, and solid-state bonding.

The report explains how each technique works and comments on the effectiveness of various applications of each.

Evaluated under fusion welding are: electroslag welding, short-arc and dip-arc welding, electron-beam welding, and arc spot welding. Resistance welding techniques reviewed are: high-frequency welding, foil seam welding, and magnetic-force welding. High temperature brazing techniques reviewed include: heavy-section brazing, thin-section brazing, and special brazing. Solid-state bonding processes reviewed are: ultrasonic welding, friction welding, diffusion bonding, and explosive welding.

Standardization applied

STANDARDIZATION APPLIED — THE PROCEEDINGS OF THE NINTH ANNUAL MEETING OF THE STANDARDS ENGINEERS SOCIETY. Published by Standards Engineers Society, 1025 Connecticut Ave., Washington 6, D. C., 1960, 86 pages. Price $4.

Articles by authorities from industry and government discuss such subjects as psychological influence in standardization, company standards departments, preparation of a standards manual, steel product standards, and nonferrous foundry standards.

Other articles in the book deal with engineering writing, basic materials code, electronic computers, evaluation of a standards program, the value of decimal dimensioning, and mill drawing specifications.

For more facts Circle No. 231 on Welding Info-Aid Card

Thermochrom*
Temperature Indicating Crayons

Easy to carry and use, Thermochrom crayons are indispensable when quick checks of hot surface temperatures are desired. A clearly visible, distinct change of color indicates temperature reached. All color changes are permanent and much easier to recognize than old-fashioned, melting type indicators. Heat indication accuracy is unaffected by high voltage, magnetic fields, ionized gases and static electricity. Eighteen crayons cover temperatures ranging from 150° to 1240°F. Crayons $2.00 each. Full assortment $36.00.

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Princeton Division CORPORATION Princeton, New Jersey
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ACRO WELDER MFG. CO.
MILWAUKEE
WELDING ENGINEERS
MACHINERY BUILDERS
ESTABLISHED 1936

ACRO® general purpose spot-projection-butt-seam resistance welding machines.

ACRO-ARC® special purpose production welding machinery employing automatic arc welding processes.

ACROMATIC® special purpose production welding machinery employing resistance welding processes.

ACRO-MAGNETIC® magnetic force spot, projection, and percussion welding machines.

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For more facts Circle No. 232 on Welding Info-Aid Card

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At the WELDING SHOW
NEW YORK COLISEUM

AND
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THE WONDERS OF . . .

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(WORLD PATENTS PENDING)

FIRST ALUMINUM & UNIVERSAL SOLDER of its kind. REQUIRES NO FLUX ON ALUMINUM and its ALLOYS . . . FLOWS AT ORDINARY SOLDERING TEMPERATURES (410° F.) WILL JOIN MOST METALS.

SEE LIVE DEMONSTRATIONS OF THE MANY AND VARIED USES OF TIN-A-LUM . . . DISCOVER ITS GREAT TENSILE STRENGTH . . . HIGH CORROSION RESISTANCE . . . AMAZING EASE OF APPLICATION . . . REMARKABLE DURABILITY AND UNUSUAL ADAPTABILITY TO ALL MANUFACTURING PROCESSES.

MANY DISTRIBUTORSHIPS NOW AVAILABLE

Get full details about TIN-A-LUM from our Representatives at Show. Samples, Prices, and Literature will be furnished.

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hammer
WITH
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This is the hammer with the balanced feel—swings easy, fits the hand properly, absorbs shock. Less fatigue and it's a pleasure to use!

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Type A 20 oz., drift and right angle chisel.
Type C 14 oz., drift and chisel.

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TYPE A TYPE C

Neutron irradiation

THE EFFECTS OF NEUTRON IRRADIATION ON THE CHARPY V AND DROP-WEIGHT TEST TRANSITION TEMPERATURES OF VARIOUS STEELS AND WELD MATERIALS. By J. R. Hawthorne and L. E. Steele. Published by Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., 1960, 28 pages. Price 75¢.

U. S. Naval Research Laboratory report tells how Charpy V-notch and drop-weight specimens were used to determine changes in transition temperatures of various steels and weld metals irradiated in different nuclear and thermal environments.

Nondestructive testing

SYMPOSIUM ON NONDESTRUCTIVE TESTING IN THE MISSILE INDUSTRY. Published by the American Society for Testing Materials, Philadelphia, 1960, 74 pages, 6 in. by 9 in. Price $2.

Radiography of weldments in motion is one of the subjects discussed in this collection of seven articles on nondestructive testing in the missile industry.

The symposium was organized to establish a background of unclassified literature on a limited number of specific applications of nondestructive testing and to stimulate thinking by outlining many of the present nondestructive testing problems in the missile industry.

Other articles in the collection deal with radiography of large solid-propellant rocket motors, missile and aircraft mobile field testing; high-energy radiography in the 6- to 30-mev range; ultrasonic inspection of adhesive-bonded aluminum sandwich structures; an ultrasonic method to detect, count, and measure fluid-contaminating particles; and ultrasonic standards for evaluation of missile materials and components.

Atomic energy research

ATOMIC ENERGY RESEARCH IN THE LIFE AND PHYSICAL SCIENCES—1960. Published by the Atomic Energy Commission. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 1961. Price $1.25.

This is a special report on the Atomic Energy Commission devoted to basic research in the medical and biological fields and in the physical sciences — high-energy physics, metallurgy, chemistry, and controlled thermo-nuclear research.

For more facts Circle No. 233 on Welding Info-Aid Card

Distributor Appointments

Ampco Metal, Inc., Milwaukee, hand tools: Engle's, Orlando, Fla.

Ampco Metal, Inc., Milwaukee, weldrod products: Ace Welding & Safety Supply, Inc., Milwaukee.

A. O. Smith Corp., Milwaukee: Florida Steel Corp., Tampa, Fla.

The Carborundum Corp., Niagara Falls, N. Y.: Geoscience Instruments Corp., New York City.

Hobart Bros. Co., Troy, Ohio: General Welding Products, Inc., Louisville; R & R Welding Supply, Rock Island, Ill.; K & K Welding Supply Co., Williston, N. D.; David F. Edgar, Bagley, Minn.; Southern Welding Supply Co., Spartanburg, S. D.; Coss Welding Supply, Hagerstown, Md.; Welders Sales & Service, Inc., Liberty, Mo.; and National Supply & Service Co., Springfield, Mo.

Hughes Aircraft Co., Vacuum Tube Products Div., Oceanside, Calif.: Brooks, Feeger & Associates, Albuquerque, N. M.; Instruments for Measurements, San Diego.

Liquid Carbonic Div., General Dynamics Corp., Chicago: Gano Welding Supply, Charleston, Ill.; Chase Welding Supply Co., Benton, Ill.; St. Louis Welding Supply Co., St. Louis.

Messer Cutting Machines, Inc., New York City: Edward A. Lynch Machinery Co., Inc. Wynnewood, Pa.

Metal & Thermit Corp., New York City: Scranton Welding Supply Co., Scranton, Pa.

Olin Mathieson Chemical Corp., New York City: Schill Steel Co., Houston, Tex.

Syntron Co., Semiconductor Div., Homer City, Pa.: Hilltronics, Inc., Detroit.

Thomas Electric Welder Co., Lunn, Mass.: Addy and Luby Machine Co., Detroit.

Unique Equipment, Inc., Brooklyn Jaeger Welding Supply Co., Springfield, Mass.

For more facts Circle No. 234 on Welding Info-Aid Card

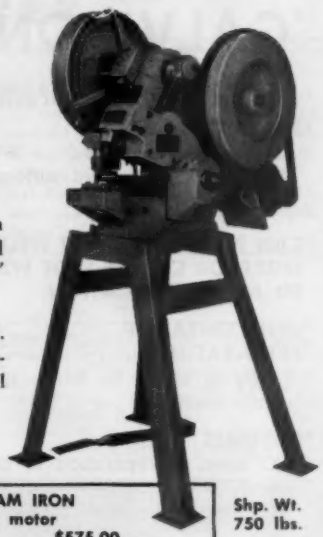
Large and Small Fabricators of steel and ornamental iron swear by it ...

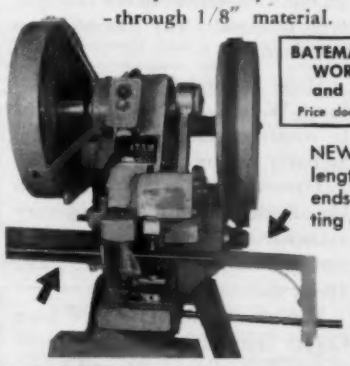
BATEMAN BANTAM IRON WORKER

The Bantam cuts and punches fast and clean . . . no grinding necessary. It's versatile, and saves time and labor! Cuts 2" x 2" x 1/4" angle and 1/4" x 4" flats.

Punches 1/2" hole through 1/4" material. Operates by hand or foot, uses 3/4 hp motor (1750) rpm., powered with flywheel and drive gear.

The Coper will cope 1-1/4" -through 1/8" material.





BATEMAN BANTAM IRON WORKER, with motor and stand $575.00
Price does not include Blades, Punches or dies.

Shp. Wt. 750 lbs.

NEW ACCESSORIES: Gauge for cutting to length, Guide for Flat Bars for cutting on ends, and Angle Iron Trimming Guide, for cutting at a 45 degree. Write for details.

WRITE TODAY for complete information and name of nearest distributor

Bateman Foundry & Machine
MINERAL WELLS, TEXAS

NEW from GLENDALE

No. GW600
Unisite Welding Goggle

The only WELDING GOGGLE ever designed to carry a magnifier

- Construction permits Supersite Magnifier to snap securely into place behind filter lens without use of tools or fuss.
- Soft construction.
- Single plate construction. Light-proof, baffled, air-conditioned.
- Adjustable Nylon headband.
- Exclusive bellows (or pleated construction permits universal fit.
- Lightweight and comfortable.

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Visit BOOTH 507
April 18-19-20, New York Coliseum

Full details and specifications on request.

GLENDALE OPTICAL CO., Inc.
600 W. MERRICK ROAD, VALLEY STREAM, N. Y.
• S-7 SPECTACLES & LENSES • FACE SHIELDS • WELDER'S AND CHIPPER'S GOGGLES • DUST GOGGLES • ACID & CHEMICAL GOGGLES • FLASH SPECTACLES • PLASTIC EYESHIELDS • CHIPPING & GRINDING SPECTACLES • WELDING PLATES & LENSES

Circle No. 236 on Info-Aid Card

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COLD GALVANIZING COMPOUND

*SPECIFIED FOR:
Repair of deteriorated or WELD DAMAGED galvanized surfaces.

Replacement of hot dip.

*CAN BE APPLIED OVER WELDED SHEET, OR CAN BE SPOT WELDED AFTER APPLICATION.

*ONE CONTAINER PREPARATION,
Ready to apply by Brush, spray or dip method.

*REQUIRES
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NO after-treatment of coating

*SINGLE BRUSH COAT
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For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

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3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux for Cast Aluminum Welding
7—Steel Flux
8—Aluminum Flux for Sheet Aluminum
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys Dow Metal, etc.
16—Silver Solder Paste Flux

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ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Circle No. 237 on Info-Aid Card

Pipeline News

FPC has granted Natural Gas Pipeline Co. of America, Chicago, temporary authority to construct and operate facilities costing an estimated $3,233,000.

Northern Natural Gas Co., Omaha, Neb., and Panhandle Eastern Pipe Line Co., Kansas City, Mo., have been authorized by FPC to construct natural gas pipeline facilities under budget-type proposals. The proposals are not related.

Hope Natural Gas Co., Clarksburg, W. Va., has been authorized to construct and operate pipeline facilities costing about $1,023,500.

Tennessee Gas Transmission Co., Houston, Tex., has temporary authority to construct approximately 50.5 miles of 10-, 12-, and 16-in. gathering lines.

Transcontinental Gas Pipe Line Corp., Houston, Tex., will build about 77.3 miles of 30- and 36-in. loop transmission pipeline in eight southern states.

FPC has authorized El Paso Natural Gas Co., El Paso, Tex., to construct facilities to acquire, process and transport natural gas from Brown-Basset Field, Terrell County, Tex. Estimated cost of the project, including 52 miles of 20-in. transmission pipeline, is $10,033,000.

According to FPC, authorization for $846,677,000 in new interstate natural gas transmission facilities was given during the fiscal year which ended June 30, 1960. This included nearly 9,400 miles of pipeline.

WHERE TO BUY

ALLEN FLUXES
SOLDERING
BRAZING & WELDING
L. B. ALLEN CO., INC.
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(in metropolitan Chicago area)

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Photo Courtesy The Lincoln Electric Co.

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ONE AMMETER
for AC/DC WELDERS
Only TONG-TEST
measures both AC and DC

Weld with confidence. Use the exact amperage — no more, no less—to assure welding quality. Prevent costly rejects by controlling the welding current (AC or DC) with one TONG TEST AMMETER. Simply snap tongs around electrode cable — read amps instantly and accurately. No electrical connections required, cannot burn out. Interchangeable ranges up to 1000 amperes.

Write for Catalog WE-400

COLUMBIA ELECTRIC MFG. CO.
4551 Hamilton Avenue • Cleveland 14, Ohio

GRAB HOLD!

This sword is the symbol of the American Cancer Society. It is called the "Sword of Hope."

Grab hold! Every dollar you give brings new hope to cancer research. Fight cancer with a checkup and a check to CANCER, c/o your post office.

AMERICAN CANCER SOCIETY

THE WELDING SHOPPER

UNDISPLAYED RATE

(Not available for equipment advertising) $1.10 a line, minimum 6 lines. To figure advance payment, count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ the above rate; minimum $5, payable in advance.

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DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Maximum size of display ad is 4 col. in. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ in. vertically on one column, 3 columns — 30 inches — to a page.

POSITION WANTED

Young man over twelve years experience all phases distributor operation, management, sales management, sales, purchasing and inventory control. Presently in key position with multiple office distributor, seeking lifetime association with sound organization. Would be interested in operating business for distributor owner ready to retire or semi-retire. Excellent character and experience references available from within the industry. Responsible position with manufacturer would be considered. Write Box No. 406, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

HELP WANTED

Manufacturers Representative wanted to sell popular line of gas cylinder trucks to welding supply dealers in Northwest and New England states. Write Box No. 403, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

SALES REPRESENTATIVE

For manufacturer of nationally advertised products distributed through Welding Distributors. Salary and expenses plus monthly bonus, profit sharing, pension, and insurance. Territory: New England and Eastern seaboard. Send resume of experience including earnings to Box No. 405, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

Sales representatives wanted to sell nationally advertised welding fume exhausters and welding booths.

ENGWALD CORPORATION

125 Sheridan Blvd. Inwood, L.I., N. Y.

CHIEF ENGINEER

Leading manufacturer of highly engineered metal working machines seeks outstanding man to direct all engineering functions. Must hold a degree in Mechanical Engineering or equivalent, and have a thorough design and related engineering background. Ability to administer a large department and lead people is essential. Location in large midwest city. This challenging position offers salary commensurate with opportunity. Reply in full, including earnings — all replies will be treated in strict confidence. Write Box No. 407, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

EQUIPMENT WANTED

WANTED — SECONDHAND

Small acetylene and oxygen generating and filling plants. Capacity about 300 c.f.h. for oxygen and 200 to 300 c.f.h for acetylene, electric or diesel powered. Must be in excellent condition and suitably guaranteed.

Friedr. Zoellner (New York) Corp.
61 Broadway • New York 6, N. Y.

EQUIPMENT FOR SALE

OXYGEN PLANT

40 meter, up to 1600 cu. ft. per hour Factory rebuilt column as new. Liquid pump new; guaranteed. $20,000 net f.o.b. Detroit. Total value with electrical equipment $45,000.

ACETOGEN GAS COMPANY
20137 Sherwood Ave. Detroit, Michigan

LOW FUMING BRONZE RODS

for Gas Welding & Brazing
Bare & Flux Coated

AUFHAUSER BROTHERS
Albertson, Long Island, New York

AIRCO CUTTING MACHINE PARTS

Huge inventory of mechanical parts (no electrical) for Airco No. 10 and No. 4 Radiagraphs, No. 10 Planograph and No. 40 Travographs. Send for part lists.

RALL SUPPLY CO., 51 E. 42nd St., N.Y.C. 17

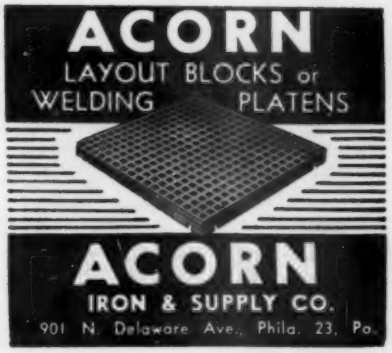
Used Taylor-Winfield 100 K.V.A. air operated seam welder, 6 degree angled heads with G.E control console, 440 volt, 60 cycle A.C. single phase — $2200.00 f.o.b. Wichita, Kansas.

DRUMCO, Inc.
121 North River Blvd. Wichita, Kansas

POSITIONERS & STAINLESS ELECTRODES

3 4800#-12" P&H WP-3; 5 2500# REED; 2 2500# Ransome positioners. P&H and REED like new at bargain prices. 1/16 to 1/4" stainless in 10# cans, type 307, 308, 308ELC, 310, 347, price .85 to .75/lb. Also surplus low hydrogen. Write for complete list.

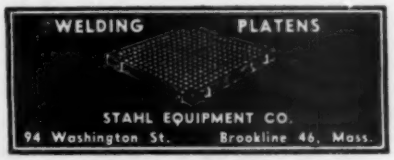
J. A. CUNNINGHAM EQUIPMENT, INC.
2025 Trenton Avenue Philadelphia 25, Pa.



SCHOOL

WELDING TRAINING. Complete or brush up courses in oxy-acetylene welding & cutting, Manual Arc, TIG, Automatic, Pipe (up & downhill), sheet metal, etc. Precode test training. Request bulletin from — Hobart Welding School, Box U-412, Troy, Ohio.

EQUIPMENT FOR SALE



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Meets all Gov't, AWS, ASTM Specifications.
Low Fuming Bronze Rod—
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145 N. Logan St.
Elyria, Ohio
ENdicott 5-1941

Literature for your library

To get your free copies, circle the appropriate number on Welding Info-Aid card. ➳

75. WELDING COURSE — Hobart Bros. Technical School. Bulletin J-11280 describes welding refresher course available to public school teachers.

76. WELDING RECORDER — Weld-Record Corp. Four-page illustrated, color booklet gives information on unit which furnishes automatic time-study data on all welding operations.

77. HELMETS, HANDSHIELDS — Linde Co. Form 1407, illustrated, four pages, furnishes information on Oxweld welding helmets, handshields, plates and accessories.

78. RADIOGRAPHY UNIT — Picker X-Ray Corp. Illustrated sheet describes 150-kv industrial radiography unit.

79. WELDING CONNECTIONS — Western Enterprises, Inc. 20-page, two-color catalog includes more than 200 illustrations of brass welding fittings, complete with numerical index, prices and picture story.

80. VACUUM CLEANERS — Clements Mfg. Co. Full-color illustrated 36-page catalog presents complete line of industrial vacuum cleaners.

81. WELDING GUN — No-Arc Equipment Co. Illustrated 4-page sheet lists exclusive features of arc-less welding gun.

82. FLUX-COATED ALLOY — Eutectic Welding Alloy Corp. Full color 4-page booklet explains firm's flux-coated silver alloy and its advantages.

83. LP GAS STORAGE — Chicago Bridge & Iron Co. 16-page brochure (G-50) describes cryogenic storage vessel line.

84. COPPER STRIP — The Beryllium Corp. 12-page Bulletin No. S-1100-A lists advantages of using firm's copper strip, gives physical and mechanical properties and tells how they meet specifications.

85. AIRLESS BLAST CLEANING — Wheelabrator Corp. Illustrated 28-page Catalog No. 951-D gives full information on airless blast cleaning equipment and its use.

86. THERMIT WELDING — Thermex Metallurgical, Inc. Illustrated 6-page data sheet (No. 7) gives basic instructions on repair of heavy parts by thermit welding.

90. SOLDERING STAINLESS STEEL — L. B. Allen Co., Inc. Illustrated sheet is picture story of how to solder stainless steel pipe and fittings.

91. RESISTANCE WELDING — Helfrecht Machine Co. Illustrated 4-page booklet lists questions and answers on firm's 3-phase silicon diode welder.

92. HOT DIP GALVANIZING — American Zinc Institutes, Inc. 34-page inspection manual governs protective zinc coatings on products hot dip galvanized after fabrication.

93. BRAZING ALLOY—Wall Colmonoy Corp. 2-page data sheet (No. 2.1.12) describes No. 160 brazing alloy.

94. MAGNETIC PARTICLE SYSTEM—The Budd Co. 4-page brochure (7M-10-60K) gives advantages, applications and operation of magnetic particle system.

95. PIPES, FLANGES, FITTINGS — Albert Pipe Supply Co. Slide card gives pipe, flange, and fitting information in permanent slide-rule type card.

96. WELDING BRANCH CONNECTIONS — H. K. Porter Co., Inc. Catalog-bulletin TF-1-59R, illustrated and in color, gives information on branch connection fittings for welding.

100. POSITIONING TOOLS — Universal Vise & Tool Co. 24-page illustrated color catalog No. 1161CJ describes rotary tables and other work-holding and positioning devices.

101. FLAW LOCATION — Turco Products Inc. Fully-illustrated 8-page booklet (A-500-1) describes system of locating flaws with dye penetrant.

102. VALVE WELDING — The Taylor-Winfield Corp. Weld-It No. 611 contains a two-page illustrated article on resistance welding compact capacity valves.

103. WELDING STAINLESS STEEL—The Lincoln Electric Co. Bulletin 7300.2, 12 pages, illustrated, gives physical properties, structure, and welding characteristics of different types of stainless steels.

104. PLASMA SPRAYING—Schori Process Corp. Brochure P.S.D. 101 describes plasma spraying process and its applications in high-temperature protection and fabrication of previously "unworkable materials."

107. WELDING POSITIONER — Airline Welding and Engineering. Bulletin AW-11-60, 1 page in color, describes a basic longitudinal welding positioner.

108. STEEL SELECTION — Climax Molybdenum Co. 77-page book is guide to combining sound design principles, proper steel selection and good treatment to gain optimum economy and material performance.

109. ULTRASONIC JOINING — Raytheon Co. Product Data 2-380 describes ultrasonic joining unit designed for working with materials previously considered too difficult to "wet" with fluxless solder or to weld.

110. EXTRUDED RECTANGLES — Ampco Metal, Inc. 4-page two-color Bulletin G-50b gives 22 new stock sizes of extruded rectangles and their uses and properties.

111. JIG, FIXTURE STANDARDS — Jergens Tool Specialty Co. 4-page folder tells how savings can be made by using standard jig and fixture components designed into a job.

113. WELDER/POWER PLANTS — National Cylinder Gas Div. Bulletin NH-182 describes two diesel-engine model welders one with a-c power plant. Bulletin NH-183 describes gasoline-engine model a-c/d-c power plant. Welders and equipment are illustrated.

116. WELDING CLAMPS — Chicago Boiler Co. Illustrated sheet lists welding and lifting clamps and includes prices, throat sizes, capacities, screw and weight.

122. STUD WELDING FASTENERS—KSM Products, Inc. Fully illustrated 48-page booklet (560 10 REV) gives standard design and specifications for stud welding fasteners.

124. NONDESTRUCTIVE TESTING FILM — E. I. du Pont de Nemours & Co., Inc. Illustrated booklet describes day pack roll film for nondestructive testing.

WELDING

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Advertisers' Lit

Literature offered in advertisements up to the 5th of last month. To g want circle numbers on fold-out card

200. All-State Welding Alloys Co., Inc.—Instruction manual on aluminum welding wire available.

188. American Platinum & Silver Div.—Booklet available, "A Complete Guide To Sucessful Silver Brazing."

208. Aronson Machine Co., Inc.—Detailed engineering data available on positioners manufactured by Aronson.

176. Auto-View Welding Helmet Co.—Write for literature on the new Auto-View welding helmet.

161. The Bastian-Blessing C Manifold Reference and Planning explains how manifolds work.

178. Becker Brothers Carbon Co available on carbon and graphit ing electrodes, rods and othe used in welding.

153. Bernard Welding Equipm Bulletin SS7 available, describing features of "Shortstub" electro

238. Columbia Electric Mfg. Co WE-400 is available on the Ton

ADVERTISERS IN THIS ISSUE

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198. Emerson Electric of St. Louis—A welding selector guide and prices on the Emerson tig welders available.

183. Eutectic Welding Alloys Corp.—Literature available on the "QuenchWeld" process and cast iron welding.

167. Fibre-Metal Products Co.—Bulletin No. 73 gives you complete helmet and accessory information.

236. Galvicon Corp.—Literature and technical data available on "Galvicon", a cold galvanizing compound.

199. The Gevaert Co. Of America, Inc.—An exposure calculator for Co 60 or Ir 192 radiography of steel is available.

163. H & M Pipe Beveling Machine Co.—Catalog available, "H&M Pipe Cutting and Beveling Machines."

202. Handy & Harman—Bulletin 20 on brazing alloys is available.

206. The International Nickel Co., Inc.—Further information on joining many dissimilar alloy combinations with "Inco-Weld A" wire is contained in a folder for you.

156. Jackson Products—Catalog available, "Arc Welding Accessories And Safety Equipment."

186. Markal Company—Send for the Markal "Thermomelt" brochure and sample pellets.

171. Merrill Brothers—Catalog C-3 available on the automatic safety lock fork lift attachment and other material handling devices.

196. Metal & Thermit Corp.—Circle No. 196 for a "Murex" electrode selector.

164. Metco Inc.—Bulletin on hardfacing by flame spraying available from Metco.

158. National Cylinder Gas Div. of Chemetron Corp.—Electrode Data Book available to help you choose the correct electrode for any application, also "Sureweld" data sheets.

184. J. B. Nottingham & Co., Inc.—Illustrated technical bulletin, "Multi-Arc Welding" gives cost comparisons and equip. specifications.

157. Page Steel and Wire Div.—A new welding wire comparison chart is available and a pocket size color code identification card.

159. Pressed Steel Tank Co.—The new "Hackney" cylinder catalog is available for your cylinder needs.

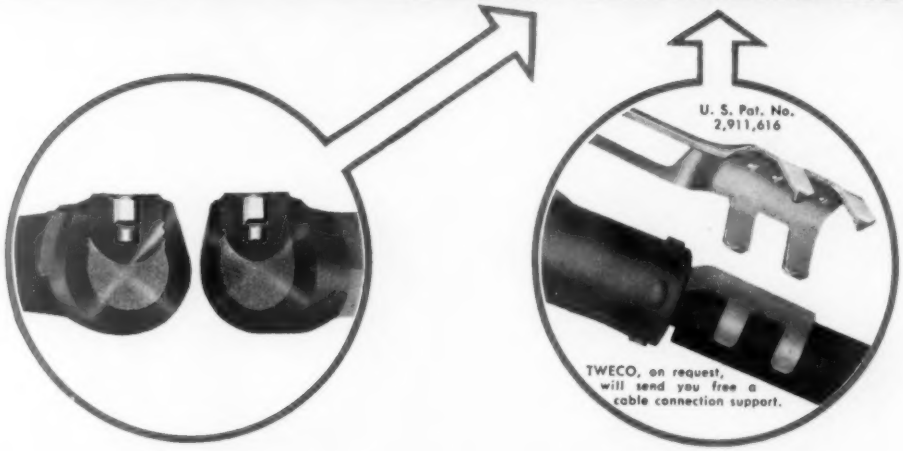
165. Singer Glove Mfg. Co.—New catalog available on Singer screens, work gloves, welding gloves and safety clothing.

191. A. O. Smith Corp.—Bulletin MW-253 further explains the Button Weld made with "C-Omanual."

193. Smith Welding Equipment Corp.—Wall charts showing flame traits of oxy-acetylene and oxy-LP gas in cutting, welding and brazing, is available.

*With TWECO, YOU'RE ON THE BALL

TWECOTONG HOLDERS *Hold rods tight. They run cool — Tough laminated insulation does not break — Well balanced — Fits the palm of the hand — Attach to cable in 2 minutes — 7 models of TWECOTONG — A size for every job.*



TWECOTONG'S BALL-POINT CONNECTION exerts high pressure on every cable strand guaranteeing 100% electrical and thermal conductivity for cool running and long life. Bare the cable end 1", insert in Ball-Point Connection socket, then tighten Ball-Point screw with strong 7/32" hexagon wrench. Do it in less than 2 minutes — EASY.

USE TWECO'S CABLE CONNECTION SUPPORT to stop fraying and breaking of cable strands right behind the holder connection. Eliminates cable strand movement and jacket slip-back at this critical place where cable strand failure has always happened. No. 10-P fits any model TWECOTONG holder and any size cable.

Tweco PRODUCTS, INC.

MANUFACTURERS: ARC WELDING ELECTRODE HOLDERS, GROUND CLAMPS, CABLE CONNECTORS, TWECO-LITE ALUMINUM WELDING CABLE

P. O. BOX 666 • Factory: Boston at Mosley • Phone AMherst 5-1684 • Wichita 1, Kansas

*HIGH PRESSURE TWECO Ball-Point Cable Connection is now available on all Twecotong Electrode Holders, TWECO Ground Clamps, Cable Connectors, Cable Splicer, Cable Lugs. Tell your welding supply distributor you want TWECO.

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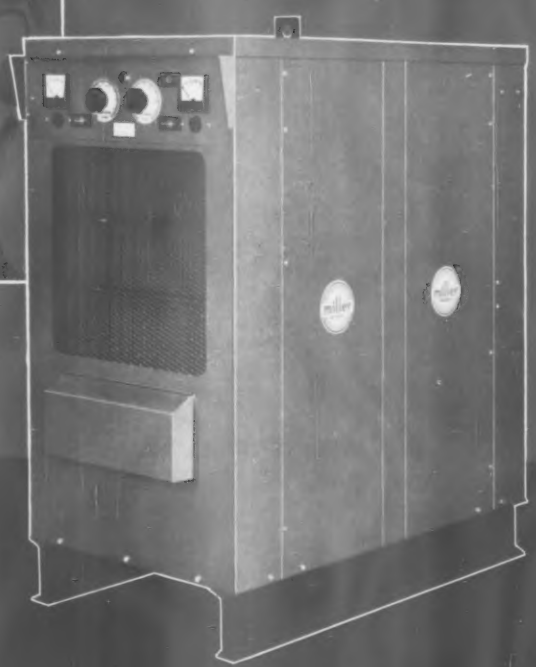
SR - 1000

UNEXCELLED FOR:

• Submerged arc and other automatic welding • Arc welding titanium and zirconium • Extreme temperature plasma jet systems • Spray • Metallic arc welding • Stress relieving • Tig or Mig cutting • Research and development.

The Miller SR-1000 series units are three-phase transformers featuring Miller's exclusive "no-fail" semi-metallic rectifiers. Basic model delivers 1000 amps at d-c at 40 arc volts. All six models have electric control and operate at 100% duty cycle. Removable control console and a wide array of other options are available. Complete details sent promptly.



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